PROCEEDINGS

OF THE

FORTIETH ANNUAL MEETING

OF THE

FLORIDA STATE HORTICULTURAL SOCIETY

HELD AT

BRADENTON, FLA.,

APRIL 12, 13 AND 14,

1927

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Florida State Horticultural Society

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President, Secretary and Treasurer, Ex-officio.

3P30
10,130

Constitution

Article 1. This organization shall be known as The Florida State Horticultural Society, and its object shall be the advancement of Horticulture.

Article 2. Any person or firm may become an annual member of the Society by subscribing to the Constitution and paying two dollars. Any person or firm may become a perennial member of the Society by subscribing to the Constitution and paying the annual dues for five or more years in advance. Any person may become a life member of the Society by subscribing to the Constitution and paying twenty-five dollars. Any person or firm may become a patron of the Society by subscribing to the Constitution and paying one hundred dollars.

Article 3. Its officers shall consist of a President, three Vice-Presidents, Secretary, Treasurer, and Executive Committee of three, who shall be elected by ballot at each annual meeting. After the first election their term of office shall begin on the first day of January following their election.

Article 4. The regular annual meeting of this Society shall be held on the second Tuesday in April, except when otherwise ordered by the Executive Committee.

Article 5. The duties of the President, Vice-Presidents, Secretary and Treasurer shall be such as usually devolve on those officers. The President, Secretary and Treasurer shall be ex-officio members of the Executive Committee.

Article 6. The Executive Committee shall have authority to act for the Society between annual meetings.

Article 7. The Constitution may be amended by vote of two-thirds of the members present.

By-Laws

1. The Society year shall be co-extensive with the calendar year, and the annual dues of members shall be two dollars.

2. All bills authorized by the Society or its Executive Committee, for its legitimate expenses, shall be paid by the Secretary's draft on the Treasurer, O K'd by the President.

3. The meetings of the Society shall be devoted only to Horticultural topics, from scientific and practical standpoints, and the Presiding Officer shall rule out of order all motions, resolutions and discussions tending to commit the Society to partisan politics or mercantile ventures.

4. All patron and life membership dues and all donations, unless otherwise specified, shall be invested by the Treasurer in United States bonds. Only the interest on these bonds shall be available for payment of the current expenses of the Society. Perennial membership dues shall be placed on deposit at interest by the Treasurer. Only two dollars and the interest from each perennial membership fee shall be available for use in payment of the current expenses of the Society during any particular year.

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Fortieth Annual Meeting of the Florida State Horticultural Society

The Fortieth Annual Meeting of the Florida State Horticultural Society was held in the Womens' Club at Bradenton, opening on the evening of Tuesday, April 12 and closing on Thursday night April 14. The headquarters for the members was at the Dixie Grande Hotel.

The credit for the success of the meeting belongs to Mr. Norman A. Reasoner, Mr. Leo H. Wilson and Miss Margaret Cobb, all of whom worked tirelessly and they each deserve the thanks of each member of the Society in attendance.

Rose Show

The Second Annual Rose Show of the Florida Rose Society held under the auspices of the Florida State Horticultural Society, the Bradenton Lions Club and the Palmetto Chamber of Commerce, and under the direction of Mr. Leo H. Wilson, the County Agent of Manatee County, was staged on the balcony of the Womens' Club and lent a beautiful touch of color to brighten the surroundings of the meeting. The show was well attended and was a decided success. Owing to the season the exhibits of roses were not as large as was expected but many beautiful specimens were on display.

Florida Rose Society

The Florida Rose Society held its Second Annual meeting in the parlors of the Dixie Grande Hotel on the afternoon of Thursday, April 14, and was well attended. A detail report of the meeting is published elsewhere in the Proceedings.

People are just awakening to the fact that the queen of flowers is very much at home in our State and is being grown more widely every year.

J. Horace McFarland, editor of the American Rose Annual says; "I am sure that if our Florida friends will take half the trouble which is found necessary to get rose success in the cold northwest corner of the United States, they will be able to issue to the less favored North, in years to come, a very rosy invitation to see the queen of flowers on her throne in the land of flowers."

Home Canned Exhibit

Staged with the Rose Show was the Home Canned Exhibit under the auspices of Miss Margaret Cobb and Miss Isabelle Thursby. This exhibit was one prepared by the Club girls of Manatee county, under the supervision of the ladies and is concrete evidence of the excellent work they are doing among the girls.

Horticultural Society Program

The program of the Horticultural Society was of the usual degree of excellence. The addresses, which are published in full in this number of the Proceedings tell the story of progress in Horticultural in Florida during the past year. Anyone who reads them carefully will, no matter how well versed he may be, gain some information of value to him. Practically all phases of citrus culture and marketing are discussed and there is much of practical value in them.

New Officers

A number of changes were made in the officers elect for 1928. Wm. L. Drew of Eagle Lake, succeeds Wm. J. Krome of Homestead, as vice-president. The new members of the Executive Committee are A. B. Michael, Wabasso, E. F. DeBusk, Gainesville, and C. W. Lyons, Tampa. Much is expected of these new members in behalf of the Horticultural Society.

Honorary Members

Three Honorary members were elected this year. These members richly deserve the honor that has been bestowed upon them on account of the very great service they have rendered the organization. The Horticultural Society in turn has honored itself by giving them this recognition. These members are, H. Harold Hume, Glen St. Mary, president of the Society from 1910 to 1922; W. J. Krome, Homestead, vice-president from 1915 to 1927; Miss Eleanor G. Shaw of Gainesville who did the very laborious piece of work of indexing the Horticultural Society Proceedings of 1909 to 1924, doing it as a work of love on account of her great interest in the welfare of the Society.

Proceedings of the
Florida State Horticultural Society

FORTIETH ANNUAL MEETING

BRADENTON, APRIL 12, 13 AND 14th

1927

OPENING

Pres. L. B. Skinner: I take pleasure in calling the Fortieth Annual Meeting of the Florida State Horticultural Society to order. Let us all rise while Rev. E. H. Jennings gives the invocation.

ADDRESS OF WELCOME

W. A. Manning, President Bradenton Chamber of Commerce

It is an old-time custom that when a visiting organization comes to a city as their guests, it is necessary for them to have inflicted upon them an address of welcome, by somebody usually that has nothing else to do and looking for this kind of a job. In this particular case, I want to disabuse your minds of the formality of this welcome to you. From this very minute, I want all of you to feel at home. I think we demonstrated last year at the convention that we wanted you as our guests.

In extending this invitation we were not entirely unselfish in our motive. In fact, we do very few things that we are absolutely unselfish in doing. We wanted you here because we realized that the work that you are doing, is fundamental in the development of Florida. We felt that your coming to this particular section would be an inspiration to us.

We also were selfish in this way—we felt proud of having a few things that we wanted to show you. We have here what we claim is one of our institutions—the Royal Palm Nurseries. Many of you are familiar with this nursery. You who are not familiar with it should visit it before you leave. I must pause here to pay our tribute and respects to the late Mr. Reasoner and his son Norman for the

splendid work that they have done in this particular section along horticultural lines.

We also wanted you to come here that we might show you some of the natural beauties of the famous Manatee River section. We have islands around here which are famous—are famous for furnishing specimens of tropical growth. The government is spending a good deal of time studying the specimens on Sneeds Island.

We also wanted you here that we might show you one of the richest agricultural sections in this State. This county normally ships around 8000 cars of fruits and vegetables. We wanted you to see our beautiful water here. We admire Lake County. We think that in many ways it is one of the most beautiful parts of this State, but we have water in larger quantities than you do. You have just ordinary water, while we have salt water down here. We are not so fresh as you are. All of these things we are anxious for you to see and become acquainted with.

We also want you to become acquainted personally with our people. You know Florida, as a whole, has the finest people in the world, because they are the pick of the rest of the country. We think we have made a wise choice here.

We want you to become acquainted with our institutions. In fact, we want you to know everything about us before you leave, and we are going to endeavor within the next two or three days to familiarize you with what we have to offer. We want to become acquainted with what you are doing. We feel, as many other sections, that we have been negligent in taking advantage of the opportunities which God has given us. We are going to learn how to do these things.

In conclusion, we want to entertain you in any way we can, to make you happy while you are here. In the name of the City and the Chamber of Commerce we welcome you. We hope you will enjoy these sessions; that you will keep your health; that you will get the proper amount of sleep, and that you will be happy while you are here. We welcome you.

RESPONSE TO ADDRESS OF WELCOME

S. F. Poole, Winter Haven

Mr. President, Ladies and Gentlemen, and Members of the Horticultural Society:

In some ways I am sorry that I am standing before you. I cannot begin to fill the shoes of Karl Lehmann. He is a much bigger man than I am, a much better speaker, bigger and broader in many ways.

A number of years ago I learned that when a thing happened once it was called "a circumstance;" if it happened a second time, it was "a co-incidence," but if it

happened a third time it was "a habit." This is the third time I have appeared before this Society in Response to the Address of Welcome, so I am sorry for your sakes, because it seems to me I am a fixture in this regard.

I am glad to be with you tonight. My first appearance in Florida was in Bradenton, a number of years ago, and I suppose that some of you believe that I have been weaned away from a good town and a good country. I admit all that, but I am one step nearer heaven in going to Winter Haven.

Nevertheless, whenever you run up against a bunch of Bradenton men, you always run into a group of live boosters. You know a number of years ago Bradentown sounded a little too provincial for you, so you must call it Bradenton. Perhaps the idea was it would carry a little more weight.

Not long ago it was my pleasure to meet a group of men as I was coming down from New York, and in that group was a New York man, who was on his way to Florida. When the train stopped at Philadelphia who should get on but a group of Bradenton men. It is needless for me to tell you who they are. You have recognized the picture. They became acquainted with the New York man. They started telling him about Bradenton, about the beauties, the wealth, what a fine place it was (a Bradenton man wouldn't be happy unless he was doing that). Finally the New York man got a little tired of it; he thought they were trying to put it over on him a little—and he said "there is only one thing you lack to make your town a seaport, and that is all that is necessary to make it the most famous town in Florida and in the world." They said to him, "How could we make it a seaport?" The New York man said "All you need to do is to build a four-inch pipe line to the Gulf of Mexico, and if you can suck as well as you can blow, you will be famous."

But I am glad to be with you, and as a member of the Society, I know we are all of us glad to be in Bradenton this year. We know we are going to have a good time. We know that all doors are open to us. If there are any plants or flowers we want, I know we are at liberty to go and help ourselves. Many of us are fruit growers; many of us lovers of flowers; many of us are vegetable growers; all being in the realm of horticulture.

In behalf of the Society, I can say that we heartily endorse the words of Mr. Manning. We appreciate this opportunity, and we will enjoy it to the utmost. I thank you.

President's Annual Address

L. B. Skinner, Dunedin

I want to pay a short tribute to a former citizen of Bradenton, Mr. P. W. Reasoner, who attended the first meeting of the Horticultural Society that I attended a great many years ago. He had a most charming personality and was a very able man. It was a tremenduous loss not only to Bradenton but to the State when he passed away. I think every member of the Horticultural Society had an extremely warm place in their hearts for him.

Looking back over the last two years, one is impressed with the serious problems and difficulties that have confronted the horticulturists of our State.

The flow of capital into the State in unheard of amounts from all over the country looked to us all at the time as a most wonderful blessing, but it brought along with it much that was undesirable. It brought trouble to most of us. Developments as they took place before our eyes, proved again the deceitfulness of riches. At an unheard of rate, prices of Florida real estate advanced by leaps and bounds, money became the cheapest thing in the State and appeared to be the most plentiful. Everybody seemed to feel that they had plenty of it and all were scrambling to get their hands into what they thought was Florida's "Pot of Gold." From every state in the union they came—also from foreign countries. The fame of Florida's boom spread everywhere. People who could not come sent their money to someone here to invest it for them. I recall one woman, who had the custody of some school trust funds which she wanted to double for the good of the school. She wrote me to invest it for her. She must be sure—certain of the profit. I returned it to her with the remark that "no gambling game was a sure thing." One could not be certain and that least of all should she risk such funds. It illustrates how wild were the ideas and how wide spread the influence of the insidious desire to make easy money without giving any equivalent in return for it. Property values went up, up and up for no apparent reason and based on no real tangible return value.

True, the sunshine of Florida is priceless, but its benefits are universal for rich and poor alike. With the plethora of money and credit, the price of everything, including labor, advanced by leaps and bounds and hit all disastrously, the grower who was trying to produce crops at a profit and the developer who was absorbing all the

available labor at any price demanded. With common farm labor going to fifty cents an hour and more, the growers cost of production of oranges, grapefruit and vegetables and all farm products doubled and trebled and no one could see the end in sight. As long as the flow of capital continued to come into the state, so long would the cost of producing our crops mount up to prohibitive heights.

It was real dangerous inflation, and while we cried out in protest when anyone saw disaster ahead—and would not listen to wise suggestions of caution, we now see that the State was speculation mad—gambling crazy.

There seemed no end—bank deposits increased, to unprecedented millions. When the flow of capital really stopped, few people realized at the time that it had stopped. Although the flow of capital toward the State had stopped in November 1925, the cost to produce the fruit and vegetables continued to increase on through 1925 and early 1926.

The tide turned, as I suppose it always will, and as quietly and as surely and as persistently as flows the tide of the seas—did this tide of the flow of capital turn and flow out from us. Capital in vast amounts had come into the State, and capital in vast amounts fled the State. Capital that could flow left us and left many of us high and dry, as on a bar. All through 1926 the necessary, the inevitable readjustment began taking place. The attempt to gather fruits without planting or profits without service, carries with itself the seeds of its own destruction. To the grower of fruits and vegetables, who was trying to produce real values for the world, the increased cost spelled almost ruin for him. If the cost had continued so great, ruin and failure must surely come to him. I don't suppose it is pleasant for any man to reduce wages, but the high scale of wages set by feverish speculative developments and the economical and profitable production of fruits and vegetables at a living profit, cannot exist together. One or the other must give in. Horticulture, and the growing of vegetables cannot give in—because the growing of them is a service to humanity—a necessity, and must prevail.

Florida's orange growers and vegetable growers can truly say, "booms may come and booms may go, but we go on forever."

But we must *grow* and *market* these for less cost than we are now doing if we are to keep in the game and we must *not let the industry be jeopardized with any new fees or burdens.* One of the readjustments is the cost of labor. Labor today in most parts of the State can be had at 60 per cent of what it cost a year ago. The adjustment has not yet taken place in some districts, but it will take place everywhere soon. Every good citizen wants labor to get as much as the industry can afford, but labor cannot itself afford to kill the goose that lays the golden egg.

The same axiom holds true of the railroads and the assessment of freight

tariffs on Florida's products. One of the high officials told me that if it had not been for the very high class rating of Florida's shipments, and the enormous earnings poured into the treasury of one of our chief railroads, it would have long ago had to go into the hands of a receiver. I am not here attacking railroads, I am just expressing the hope that some day some high official with the power and ability to put it over, may do for Florida what was done for California and give us the benefit of the system of rates that prevails from California east. It is fine to build new railroads, to develop new territory, to grow more products for the market. We do not like to feel that we are approaching the point of saturation of the market, but nevertheless, we realize that if the supply is increased at all, that something must be done to increase the demand, or to lower the cost of production and marketing. With Texas planting millions of grapefruit trees on the most fertile soil, the future of the grapefruit faces a possible serious over-production. If the men who dictate the policies of the railroads, could be brought to see that the future of our industry is vitally bound up in this freight rate problem, it would accomplish more for the State than a boom in railroad building. It is freely admitted by most railroad men, unofficially, that the industry should have better rates. It is admitted unofficially that our rate system is antiquated out of date—that we should not only have better rates, but should have a better rate structure. The Growers and Shippers League has spent an enormous sum in the last three years trying to get lower rates and a more modern rate system. In the recent hearing on this case, there was produced a copy of a report prepared by one of our railroads for the high officials. This report was made to show the cost and the profit of Florida's perishable freight movement. There were less than a dozen copies made and these went only to certain high officials. It was for their own information and not for public consumption. In some way a copy of this report came into the hands of the attorneys in the case, who represented the growers and was offered in evidence before the examiner for the Interstate Commerce Commission who was conducting the hearing in Jacksonville. This report showed in cold figures the tremendous profit the railroads were receiving from the perishable freight of Florida. It is correct beyond a doubt. It was prepared by the railroads themselves, for the confidential information of the higher ups. It put into concrete form that which we all know to be a fact, viz., That the perishables were being bled to death for higher profits for the railroads. It demonstrates beyond any question to the mind of any fair man that these rates were too high. But the railroad attorneys objected, claiming that this report was the private property of the railroads and asked the Examiner to have it returned to them, and that it be

not admitted as evidence, and the Examiner unfortunately, decided to exclude it from the record. It was conclusive, beyond the shadow of a doubt, it was a bombshell in the camp of the railroad attorneys at the hearing. But it was not admitted as proof for technical reasons. If our industry is to expand, we must have lower cost of marketing and the freight rate is one of our most serious burdens—and this freight structure seriously handicaps our marketing agencies when a car reaches certain markets.

We are then at the mercy of the buyer unless we take a loss of twenty cents per box or more in moving the car to another market.

In August, 1920, after the production of a tremendous crop at top, post-war cost, right at the beginning of the harvest and market season, freight rates were advanced overnight 35 per cent to 40 per cent. The farmers were defenseless in promptly adjusting their programs to meet such an unheard-of and radical procedure, whereas the manufacturers and other business men found it both possible and necessary practically to cease business for the time being in order to reach an adjustment to the new basis. The farmers are still suffering from this unprecedented action, i. e., the 35 per cent freight rate increase, the effect of which may be visualized by estimating what the effect would be on the railroads if freight rates were overnight reduced 35 per cent. There can be no question but what the farmers on their products paid all of this increase in freight. Practically none of it could be passed on to the consumer; in fact, the record shows that the wholesale market and consumer prices declined violently closely following the 35 per cent freight increase.

While this overnight 35 per cent advance in freight rates in August, 1920, saved many railroads from bankruptcy, there were eleven times as many farm bankruptcies in 1925 compared with fifteen years before. This 35 per cent advance in freight rates was a large contributing cause.

The railroads and the farmers have been the most important factors in our national life, whose destinies and success have been fluctuating violently during the past decade, partly, if not largely, because of arbitrary and mistaken judgment and action of governmental processes.

The remedy to the farmer is not more legislation, but rather undoing some legislation already existing, which has doubtless outlived its usefulness. It is holding this young but gigantic industrial and agricultural nation in a strait-jacket now.

It is not generally believed, although absolutely true, that the farmers paid and are paying practically all of this large increase in freight rates. The consumer will not feel any effects whatever of a decrease in freight rates until such decrease stimulates additional production, which process is slow and orderly.

A material reduction in freight rates when it can be justly secured, will direct-

ly and immediately benefit the producer to the full extent of the reduction. The *burden of proving the unreasonableness of freight rates has been shifted by recent national legislation from the carrier to the shipper. This burden of proof is an impossible one for the farmers to assume.* No one but the railroads has the data, organization and facilities to prove before an impartial, competent tribunal whether present freight rates are justified.

When we first had railroads, the predominating source of all wealth was agricultural production. On that account, land and its products were expected to "pay the freight," in taxation and everything else. Class rates, as well as the tariff, were devised to encourage manufacturers and a system grew up, therefore, immediately beneficial to the manufacturer, which enjoyed a real differential. But now the situation has been completely reversed. It is agriculture that needs the encouragement, rather than industry.

How many of you know just what it cost you per box to produce your fruit the past two seasons? How many of you have ever set down in cold figures the cost per box you paid to produce it? I confess the results astonish me. I could not believe that the cost had more than doubled—not counting the overhead or the interest on the investment. Each additional penny of production expense costs the industry as a whole two hundred thousand dollars, and five cents would mean a round million. When you take an inventory of production costs and charge for labor, spray, fertilizer, cultivation, pruning, frost protection, perhaps irrigation, machinery and machinery upkeep repairs, picking, packing, hauling, and add to this the inspection fee for green fruit and then get our market report showing the amount of the sale with deduct freight—$1.00 or more; deduct 25 cents for refrigeration deduct drayage, deduct selling costs, deduct allowance for decay, caused by slow movement perhaps. (We wonder who this fellow deduct is who gets all of this money), we wonder that there is anything at all left for the poor grower. We have to face the facts. We must grow fruit, pack it, sell it, and ship it for less cost if we are to have a profit.

Our State Experiment Station is one of the State's most valuable assets—and its bulletins are indispensable to the grower who would be up to date. I have many of the bulletins issued by it. I have one on fertilizer experiments conducted by Prof. Collison, bulletin No. 154. It is a most valuable book for the grower, small in size, but big in the field it covers, and tremendously valuable in the solving of the problems it seeks to solve. If you are a grower and do not have this bulletin, by all means get one if you can. It will repay very careful study. There is a bulletin issued by the U. S. Department of Agriculture, compiled by our Mr. Yothers. It treats on the making of oil sprays. It will save you money to study it. We have got to emphasize this word "economical" in our production costs. We have got to save the

pennies in the production, if we are going to have any dollars on the profit side of the sales. We have in the State almost as many non-bearing trees as we have bearing trees.

Our problem is along two lines—lower cost of production and increase the demand. We know the demand has been very greatly increased in the past ten years. Perhaps fifty cars of grapefruit a day was all the country could take then without the market going to pieces, while today it will absorb 100 cars. Through some national advertising scheme supported by the industry as a whole, by real co-operation between all of our marketing agencies the demand for Florida fruit can be increased by fifty per cent at least. We must do it.

We have hurricanes as well as booms, while it is hard to tell which storm was the worst, I believe we will revive from the hurricane first, and Florida will come back with lightning like rapidity. She has stood the storm and stress of a collapsed boom with all the terrible readjustments that it entails. She has had the worst hurricane in the State's history, and is recovering, she has had the worst freeze in ten years or more, and she is recovering, and in a few sections of the State they have been visited with the disastrous effects of a hail storm, all within a period of a year and still she stands without a peer in the sisterhood of states.

The flow of capital has again started toward the State. Money is again seeking Florida for legitimate chances to invest and build, and plant and receive the profits thereof. And these opportunities are now many and of real worth. But as I say, we must, in our fruit production find what profitable production is, what and how, where and when to plant and how to grow and how to market our products.

I have been asked many times this question—"Why does California get a higher price for her oranges than does Florida?" That is a vital question, why? And if we know the "why" can we meet the situation and produce a better fruit than California? We already produce a better grapefruit. Can it be done with oranges? The public gives the final verdict—what will tend toward this end.

Right here I want to inject a subject that has occupied my attention a good deal for some years. I live in a county with a great deal of soil classed as "Norfolk sand." On this soil orange trees budded on lemon root thrive and grow well, but with some varieties the quality of the fruit is inferior. Notably is this true of the Temple orange, which dries out before it is ripe or colored. I had a Temple orange grove budded on rough lemon. The trees grew beautifully, but the fruit was worthless from a commercial standpoint. I rebudded the trees with Norris early, budded into Temple, top-worked them, with the result that the Norris, on Temple, on lemon is also very unsatisfactory. It inherited the drying out tendency from the Temple. I also had some Golden Ring budded on lemon root and did not like these, so I bud-

ded Norris Early on Golden Ring on lemon. The buds on Temple dried out very early. The buds of Norris on Golden Ring, on lemon, produced fruit that was perfect in quality and did not dry out. So we began to investigate "Sandwiches" as they are often called. I understand this practice of using a sandwich in nursery and in top working trees is used a great deal in the apple industry, and to great profit as to quality.

We found that navels used as a sandwich had certain favorable tendencies on grapefruit. In fact, we have discovered enough to be sure there is here a tremendous field for experiment, rich in possibilities with the assurance that much of great value will be discovered. Will a Tangerine top worked in a Valencia bud, on a rough lemon root, have a tendency to hold its juices later? I don't know now, but I will know. Will the Bureau of Plant Industry through its plant investigation department go into this matter? I would like to have the Society ask them to investigate and experiment along these lines. I am doing something along that line myself. We must improve our fruit quality. *We must extend our maturing season.* Can it be done by means of " sandwich?" I feel that there are great possibilities here, both improving the quality of your fruit and in the quantity of it too. By all means let us experiment with the orange "sandwich."

How much do we know about fertilizing that will produce early fruit, very little, but there is no more vital question before the grower, than to know how he can hasten the maturity of his fruit.

Can this be done safely in any way, either by fertilizer or cultivation or in any other desirable way.

Many years ago, "Ponce de Leon" came to the State seeking the Fountain of Youth. Today hundreds of thousands of people from all over our country come to Florida seeking health and youth in its winter sunshine. Florida has one of the healthiest winter climates in the world and the best place to build future winter homes in the whole world. Thanks be to God, the sun still shines in Florida in January. They come seeking the "Fountain of Youth." They may be sure it is found here in Florida sunshine, and in Florida sunshine, wrapped up in golden Florida oranges and grapefruit—matchless for eating quality—for genuine merit and for renewing health. Florida has a future—Florida will become one of our greatest states. The future is before us and it is full of promise. I have faith in her future.

The Farmer's Position in Modern Economic Society

Walter J. Matherly, Dean of College of Commerce and Journalism
University of Florida, Gainesville, Fla.

Mr. President, Ladies and Gentlemen:

The history of the world is largely the history of agriculture. The farmer's progress from primitive eras to the third decade of the twentieth century is a long and painful process of evolution. First, the domestication of animals; then the beginning of plant cultivation; then the flocks and herds of Palestine; then Greek and Roman husbandry; then early agricultural development in Northern Europe; then manorial economy; then the decline of feudalism and the agrarian revolution; then the recapitulation of the history of agriculture in the United States; and finally the transition in the United States and the rest of the world to commercial agriculture. Such is a lightning sketch of man's evolution from savage beginnings to present-day agriculture organization. Such likewise is a glimpse of the most striking and typical steps in the history of mankind.

Since the farmer's history is closely connected with the history of man; since what the farmer does aids or hinders, advances or retards, stimulates or represses the progress of mankind; and since mankind is vitally interested in things economic, I want briefly tonight to analyze the farmer's position in modern economic society, indicate where he stands, and as a student of economics suggest some of the difficulties he faces today as compared with those of a half century ago.

THE FARMER'S POSITION IS ONE OF PRIMARY PRODUCTION

In the first place, the farmer's position in modern economic society is a position of primary production. The farmer is the center from which all production emanates. He is the first link in the chain of production. He is the producer of producers, the producer extraordinary, the producer *par excellence*.

Economists generally agree that there are three classes of industries or economic activities; first, primary; second, secondary; and third, professional and personal services. Primary industries consist of the extractive industries such as mining and lumbering and the genetic industries such as agriculture and forestry. Secondary industries comprise manufacturing, transporting, storing, merchandising and financing. Primary industries

are the initial, the basic, the supreme industries; they are the foundation stones on which all other industries rest. Since agriculture is primary rather than secondary, agriculture occupies a strategic position in the economic organization of society.

Agriculture claims a large proportion of American population. In 1920 there were 31,614,000 people on the farms. That represented about 30 per cent of our total population. In 1925 the farm still held 31,134,000; but if the total population be estimated in that year at 115,000,000 there was a relative decrease of about two or three per cent in the number of people on the farms as compared with 1920.

Again, in 1920 there were 41,614,000 people gainfully employed in the United States. Of this number 10,935,000 were engaged in farming. That comprises about one-fourth of the total.

In addition to a large proportion of our total population, agriculture claims a large proportion of our landed area. In 1920 it was estimated that there were 1,903,000,000 acres of land in the United States. Of this amount 955,884,000 acres were in farms, either improved or unimproved. This represents almost one-half of the total. Since 1920 little or no change has taken place in the relative quantity of land devoted to agricultural purposes.

Agriculture comprises not only a large part of the nation's landed area, but also a large part of the nation's wealth. According to the Statistical Abstract of the United States, (1925 edition) the only source of information from which I had time to secure statistics, the wealth of the United States was estimated in 1922 at $320,000,000,000. No estimates of agricultural wealth strictly comparable with this figure are contained in the 1925 edition of the Statistical Abstract. The only figures available for this purpose are those of 1920. In that year the value of all farm property was estimated at $77,924,000,000. Comparing these two estimates of different dates and for that reason subject to a large degree of error, agriculture represents almost one-fourth of the total wealth of the United States.

With modifications, agriculture occupies more or less the same status throughout the world. Whether in our own country or elsewhere the farmer generally is a primary contributor to social well-being. His position in modern economic society is a position of primary production—a position of primary economic and social importance.

THE FARMER'S POSITION IS ONE OF ECONOMIC INTERDEPENDENCE

In the second place, the farmer's position in modern economic society is a position of economic interdependence. The farmer's economic independence of a half century ago has disappeared. In its place has come economic interdependence—economic interrelationships of a far-reaching character.

Suppose we compare the modern farmer with the farmer of fifty years ago or even with the farmer thirty years ago in the same sections. The farmer in those

days practiced barter. When he exchanged at all he exchanged goods against goods. His farm was a self-sufficing economic unit. He produced everything he needed. He did not have to depend upon the outside world for what he consumed.

I was born on the western edge of the Southern Highlands. The farm upon which I was reared consisted of eighty-six decidedly lean as well as decidedly hilly acres. We grew almost everything we needed to satisfy our wants. We produced a large proportion of our own food and clothes. We used sorghum as a substitute for sugar and sassafras tea as a substitute for coffee. Even yet, when I have sufficient income to procure most of the comforts and some of the luxuries of life, I revert to type and find myself regarding tea and coffee as luxuries.

But the farmer has passed out of the stage with which I was concerned as a boy. Today he produces for the market—a world-wide market. He grows corn, cotton or wheat and sells his products for cash and then uses that cash to buy those goods which he needs. No longer does he make use of barter. He lives in the midst of a money economy, buying and selling everything in monetary units. He is no longer economically independent; he is economically interdependent.

The modern farmer is a specialist. He lives in a society of specialists. He concentrates on those goods which he is best fitted by native ability, climate and geographical location to produce and exchanges them for cash or credit and then uses that cash or credit to purchase those goods which he must have but which others are best fitted to produce.

Each territory specializes in its own specialized products and co-operates with other territories. Alabama specializes in raw cotton, steel and cotton goods and Georgia and the Carolinas in raw cotton and tobacco and in cotton goods and manufactured tobacco, and uses these products to procure the rest of the commodities which they consume. Minnesota and the Dakotas specialize in wheat growing and thereby build up credits to secure clothes and other types of consumable goods. Florida specializes in winter resorts and in citrus and vegetable production and utilizes the wealth created therefrom to buy the other means of subsistence.

Such territorial specialization is the order of the day, we can not escape it. Neither can we escape territorial co-operation. I have heard a great deal in the South about crop diversification. I have heard Southern cotton farmers severely criticized because they did not produce more wheat, corn and livestock. Many leaders in the South strenuously argue that we must produce our own meat and bread rather than import it from the outside, but I wonder if the farmer is altogether responsible. Aren't there economic forces at work over which the farmer has no control? Isn't he simply forced to specialize?

We live in a section where soil and climate compels us to follow certain lines of specialization. We are forced to produce a single crop or at most two or three crops and exchange the cash therefrom

for those things which other sections can produce more cheaply than we can produce. After all this is a more economical method than to try to create our own meat and bread or to attempt to become a self-sufficing economic unit. If we diversify at all we should diversify only to the extent of creating by-products. To produce everything we need for home consumption may be the utmost wastefulness. We must remember that the South is better fitted by natural endowments to grow cotton, tobacco, citrus fruits and vegetables than to grow breadstuffs and livestock.

The farmer not only specializes and cooperates, but he also competes. Present-day economic society is a society of world markets. Every agricultural producer competes either directly or indirectly with every other agricultural producer. The western wheat farmer competes with the wheat farmers of Siberia, Argentine and India. Sheep from Australia competes with sheep from Vermont and Ohio. Horticulturists in Florida compete in one way or another with the horticulturists of California.

The farmer's position in modern economic society is simply a position of economic interdependence. The farmer is no longer independent. He is interdependent. He is subject to a multitude of forces over which he has little or no control. His troubles after all may be due to the fact that he has failed to understand the principles of economics underlying the changes which have occurred in agricultural production during the past half or three quarters of a century.

THE FARMER'S POSITION IS ONE OF BUSINESS RELATIONSHIPS

In third place, the farmer's position in modern economic society is a position of business relationships. The modern farmer is a business man. If he is not a business man he usually fails. President Butterfield has said that the farmer is a business man with all the business man's worries, but without the business man's equipment.

The farmer today is an American citizen growing wheat instead of manufacturing steel, producing citrus fruit instead of operating a bank, or raising wheat instead of running a railway. The problems facing the agricultural producer are the same as those facing the manufacturer, the banker, or the railway manager.

The farmer's business relationships may be summarized under four heads: first, his relationship to production; second, his relationship to marketing; third, his relationship to finance; and fourth, his relationship to risk.

The farmer's relationship to production is a technical relationship. It involves the process of producing. It is like the technical process of manufacturing. We assume that the farmer knows how to grow crops. The problems he faces here are similar to the manufacturer's problems of technique. When President Skinner speaks of perfecting the quality of citrus fruit he is speaking of a technical problem of production. The horticulturist here like the manufacturer may call in the scientific expert and seek the means of improving production proc-

esses and perfecting quality. The farmer's relationship to production is important but it is by no means his most important relationship.

The most important relationship of the farmer is his relationship to marketing. His main task is not to grow but to make products sell for more than they cost. If he hasn't the ability to do this others with the requisite ability will exploit him.

Originally markets were near by; agricultural products were sold in the immediate locality where they were produced; but today the markets are distant. Marketing forces far beyond the private door-steps of any individual farmer affect the prices at which agricultural products sell. Since the farmer like every other producer sells in a world market, his relationship to marketing encompasses the whole world.

The farmer's relationship to finance involves the financial organiation of society. It concerns financial structure of the nation. Within this financial system, the farmer competes with others for capital. Lack of financial understanding has frequently cost him dearly. He can not secure credit advantageously until he knows the credit system. As long as he is guilty of financial ignorance the money lenders will take advantage of him.

The farmer is also concerned with risk. He anticipates demand. He forecasts the future. He attempts to estimate what commodities consumers will demand and in what quantities, and then proceeds to plant corn or wheat, cotton or tobacco, orange groves or berry farms in anticipation of that demand. His forecast may be incorrect. The time between planting and harvest may be months or even years and when he brings his products into the market, changes either in demand or in supply or in both may wipe out every vestige of anticipated profit.

Add to these market risks the hazards of nature such as frost, hail, storms and so on and the farmer faces a multiplicity of slips between the cup and lip. Of course these risks can be reduced either by insurance or by scientific investigation, but there is an irreducible minimum of uncertainty which can not be eliminated. Perhaps the farmer will always face a greater degree of uncertainty than any other producer.

Mr. James Wilson has summarized the farmer's risks in the following way: "The farmer supplies the capital for production and takes the risk of his losses; his crops are at the mercy of drought, and flood, and heat, and frost, to say nothing of noxious insects and blighting diseases. He supplies hard, exacting, unremitting labor. A degree and range of information and intelligence are demanded by agriculture which are hardly equaled in any other occupation. Then there is the risk of over-production and disastrously low prices. From beginning to end the farmer must steer dextrously to escape perils to his profits and indeed to his capital on every hand."

The farmer's position in modern economic society, then is a position of pri-

mary production. It is a position of economic interdependence. It is a position of business relationships. Since the farmer is the first link in the chain of production, since he is dependent upon the co-operation of and competition with specialists and since he is a business man, he must be a student of economics. He must know the significance of economic forces. He must familiarize himself with the operation of economic laws. When he knows more about economics he will make fewer mistakes, his profits will perhaps increase and his service to mankind will be more greatly appreciated.

Factors Affecting Quantity and Quality in Citrus Fruits

E. L. Lord, University of Florida, Gainesville

The interest of fruit growers must in the nature of the case be centered on the quality and quantity of the fruit produced.. This interest has always been reflected in the previous meetings of this Society, and no doubt will continue to be a vital topic for discussion at future meetings for years to come. This paper is presented to the Society, not with the idea that anything new or startling has been discovered, but rather with the purpose of making a survey of the subject from a slightly different angle from that of previous discussions.

In the first place it must be emphasied that the factors affecting fruit quality are related to those affecting quantity both directly and indirectly; that conditions favoring quality tend to reduce quantity and vice versa; and that citrus fruit growing must be a compromise between these groups of two factors; for we can not make a profit if we produce a small amount of fruit of good quality or a large amount of fruit of poor quality.

Furthermore, in discussing the factors involved it may be pointed out that while any factor mentioned may be of importance no way has yet been found to measure its relative value. In consequence each grower must use his own judgment in evaluating the relative importance of these factors in handling his own grove. No attempt is being made to lay down rules for guidance; it is more desirable to discover fundamental principles which the grower may apply to his special needs and purposes.

Let us first take up the factors in the environment which affect quantity. In order to get a maximum crop it is necessary that the tree be situated in a favorable soil, that is, one which contains at all times sufficient water and plant food for full development. In order to contain at all times a large amount of plant food such a soil must have a heavy water holding capacity. It will also be well drained, with an abundant humus supply, a favorable soil reaction (neutral or slightly acid), the largest possible amount of favorable soil bacteria, sufficient plant food so no deficiency may act as a limiting factor, and there must be no toxic substances in the soil which might prevent absorption or injure tissues. In order to develop and maintain such soils in Florida attention must be paid to fertilization, cover crops, irrigation, drainage and cultivation. A further requisite

is the securing of protection from frost damage. This is best achieved by locating the tree where this type of damage is at a minimum. Frost protection by location is the cheapest and most satisfactory form of protection. Frost injury affects quantity by destroying bloom or by reducing the top. This second effect is similar to that produced by top pruning, which indirectly affects yields.

The tree should also be protected from injury by disease, insects and other pests. Any agency which reduces the size of the top or root system, or impairs their function, reduces in like proportion the quantity of fruit produced. There is no necessity to go into this question in detail as the pathologists and entomologists have shown you how to eradicate or control these troubles.

Another factor involved has to do with root stocks and root systems. In order to get maximum results it is necessary to have a vigorous, large root system suited to the type of soil in which it is planted. Not only should it be suited to the soil, but also to the type of cion which is top-worked upon it. It is not necessary to elaborate on this factor either, as citrus growers have had this phase of the subject thoroughly driven home to them. The root stock must be free from disease and insect damage, and to be long lived should be congenial to soil and cion.

The citrus tree producing the largest crops must have a vigorous healthy top adapted to the stock on which it is worked. There should be no interference with the flow of soil solutions from the root to the top, nor of plant food from the leaves to the roots. The foliage must be heavy, active, free from disease and insects. The growth of the previous season should have been sufficient to produce as many fruit buds as the tree requires and to carry as much fruit as the root system can supply with water and nutrients. All pruning of active healthy leaf areas must be avoided, as its effect is to reduce yield. The frame-work of the tree must be built up in such a form that it will carry maximum loads without injury either to the fruit or to the tree itself. In order to produce a sufficient quantity of marketable fruit it is necessary to see that the root system, trunk, leaves, buds, bloom and young fruit are not harmed in any way by disease, insects, or cold, or by mechanical injuries.

All the above factors are well known and understood by the citrus grower and do not need elaboration or further discussion, but there are many other factors which are little known although they may affect the quantity of fruit produced to an equal extent. Suppose we have a vigorous orange tree with healthy root, trunk and leaf systems, a favorable soil, adequate water and food; in other words everything mentioned above which favors the production of a large quantity of fruit, yet many times there is a short crop. The conditions which bring this about may be within the control of the grower; yet because of imperfect knowledge his remedy for it may be entirely inadequate. Most citrus growers know that the blooming period is a critical time in the life of the crop, yet few realize that it is possible to partially con-

trol the amount of the bloom produced and of fruit set. The citrus flower is usually self-pollinated, in other words does not require the assistance of bees in order to set a crop. The fact that this is true saves the citrus grower much trouble. Other factors, however, may affect fruit setting if overlooked. For example, while there may be an adequate supply of water to favor growth throughout the entire season, yet a temporary deficiency at or preceding the blooming period may cause a short crop. In the same way a temporary deficiency of important food elements, particularly nitrogen, may produce a like result. An attempt to protect trees against cold damage by nitrogen starvation may cause the loss of a considerable portion of the bloom. The effect on the nitrogen reserve brought about by the heavy yields of the preceding year is also underestimated. While the color of the leaves is usually a good indication as to whether the tree is getting sufficient nitrogen during the growing season, yet the fact should not be overlooked that a tree which has had an adequate supply of nitrogen all winter may be suffering from nitrogen starvation by the time it is in full bloom, due to the fact that the nitrogen reserve is used up in building new tissue and conditions have been unfavorable for renewing it. Generally a liberal application of nitrogen in a soluble form to the tree several weeks before the blooming period is one of the most effective means of increasing the crop.

Assuming that we have supplied all the conditions necessary to bring out a heavy bloom, yet there will be times when bloom does not show up on the spring flush. If the grower is observant this condition will be accounted for by a previous unfavorable growing season but this is only a partial explanation. Let us look farther and see if we may find the reason. In the citrus groves of California it has been found that there is a direct relation between the character of the growth of the previous season and the subsequent bloom. There is no doubt in my mind that this relation holds true also in Florida. The orange tree grows by a series of flushes which are responses to the tree's environment. Normally there is a spring flush which tends to check during the dry months of April and May; then the summer flush beginning with the rainy season and diminishing again with a lack of water or plant food; and sometimes there is a fall flush if conditions are favorable. In young, well-fed trees with a constant water supply there may be no break between these flushes, but each flush tends to become shorter as the age of the tree increases. In young trees where the growth is nearly continuous, conditions are unfavorable for fruit bud differentiation. Consequently conditions tending to check young trees favor early bearing. When the growth is upright and vigorous in young trees they will usually be unproductive and only as the summer growth becomes less will the trees come into bearing. An abundance of nitrogen and water and a capacity in the stock and cion enabling them to use raw materials to best advantage are not conducive to early bearing. Certain com-

binations of stock and cion, however, particularly those showing unequal unions, tend to differentiate their bloom when very young and are heavy, consistent producers during the life of such combination. On the other hand these trees are more or less short lived. Even a vigorous type of tree with perfect union which would normally not produce when young may be thrown into bearing by any factor or combination of factors which tend to check growth between May and August. Root pruning, heavy potash fertilization, lessened supplies of water, girdling, bending of limbs, are all agencies which tend to increase the carbohydrate-nitrogen ratio and consequently to stimulate fruit bud differentiation. Top pruning, heavy nitrogen fertilization, shortage of potash and frequent shallow cultivation tend to lessen this ratio and thus delay fruiting. In mature trees well supplied with foliage fruit bud differentiation normally occurs if the trees are well fed, but if they are carrying a heavy crop the burden on the trees may be such that they may suffer from nitrogen starvation as shown by a loss of color in the leaves. If a nitrogen reserve is not built up there will usually be a short crop. If these statements are correct, and I believe them to be thoroughly sound, then quantity production on mature trees will require liberal feeding of all nutrients up to capacity in spring and early summer. In young trees just coming into bearing a formula high in potash and low in nitrogen would be indicated for summer fertilizing, and the application of an abundant supply of soluble nitrogen two or three weeks before blooming would be found desirable on both young and mature trees. Unfortunately some of the more common forms of soluble nitrogen, such as sulfate of ammonia and nitrate of soda, have often given undesirable results; probably due either to their unfavorable effect on soil reaction, to a lack of humus in the soil, the loss of too much nitrogen by leaching, or undesirable residues. An application of one of the newer forms of soluble nitrogen such as urea or calcium nitrate will usually give better results. Urea in particular seems to be well suited to this purpose and I believe that as it becomes more easily obtainable it will be a very valuable agent in the hands of the citrus grower who learns how to use it properly. It seems to leach much less readily than the other forms of soluble nitrogen, to injure the plant less when fairly high concentrations are used, and to leave no harmful residues.

If the discussion of the factors affecting quantity of fruit seems to you inadequate, the following on those factors affecting quality will appear still more vague.

In the first place no type of grove handling will make a variety which is naturally of poor quality into a first class fruit. In some seasons and under some circumstances it may be better than at others, but in the long run there will be little profit in handling such fruit.

The question of quality is not always well defined by either the grower, the shipper or the consumer. The grower considers a fruit of high quality if he can enjoy it on his own table; the shipper

recommends its quality if it tops the market for its season; while the consumer selects it for its appearance, flavor, and keeping qualities when he buys it from the retailer. In consequence we must differentiate between fruit quality and commercial fruit quality. A fruit may be very pleasing both to the eye and to the palate and yet be entirely unsatisfactory when placed at the mercy of the assembling, transporting and distributing agencies. All of you know of varieties which are fine fruits when grown at their best, yet which reach the consumer in the north in a state unfit for human consumption. In fact certain varieties can only be enjoyed in the state, as they are unfit for transportation. Such varieties should not be planted extensively or if already planted should be top-worked as soon as their faults are discovered. How can we define a fruit of first class commercial quality? To my mind an orange should be well shaped, have a thin, smooth rind, well and evenly colored, with no defects or injuries. The pulp should be juicy with a minimum of rag, practically seedless, and with an even blending of acidity, sweetness and flavor. It should have these characteristics not only when picked from the tree but when it reaches the consumer. Otherwise it is not a satisfactory commercial fruit. It is easy enough to define such a fruit but not to produce it. It requires a climate with adequate moisture and heat, a soil lacking neither humus, water nor plant food, a root-stock which can supply water and nutrients to the top slowly and evenly, with no tendency to force excessive growth and consequent coarseness, or to dry out the fruit before maturity; and a top with healthy foliage lacking the deep green of vigorous growth. It implies proper choice of variety, proper protection of the surface of the fruit from diseases, insects and other injuries which may mar its appearance, moderate or even scanty fertilization and cultivation, particularly in summer and fall. In fact from the tree standpoint the best fruit is produced where there is a slow, even and regular development of the fruit from the time of blooming until it is harvested.

This gradual growth is more easily achieved on old trees than on young ones; with Pineapples rather than Valencias; with trees on sour orange or trifoliate rather than those on rough lemon; on hammock soils with moderate fertilization rather than on high pine land heavily fertilized; with a minimum of cultivation rather than with a maximum; with soils which have carried leguminous cover crops for several years rather than those without such treatment; on irrigated areas rather than unirrigated; on well drained areas rather than poorly drained ones; with trees pruned lightly rather than severely; on trees with normal foliage rather than on defoliated trees; in groves that are protected by spraying and dusting rather than in neglected ones; on soils which are fertilized moderately rather than heavily; on soils high in potash rather than low; those low in soluble nitrogen rather than high. Some of these factors are the exact opposites of those favoring the quantity of fruit and there

is no doubt that treatment which tends to produce fruit of high quality often lessens the amount. Is it possible to effect a compromise? I believe that it is; yet it is the job of each grower to find the middle point best suited to his conditions. To a certain extent the grower can furnish treatments which favor quantity production. After the fruit has set and reached a certain size the soil and fertilizer may be modified to such an extent as to favor more gradual increase in the size of the developing fruit. The grower who harvests his fruit before the spring blooming period is especially fortunate because with the late fruit, Valencias in particular, conditions favoring the set of fruit also favor the drying out of that already on the tree. Even if the grower follows a definite compromise which has been successful in the past, adverse weather conditions may throw the whole mechanism out of joint and he may neither have a heavy set of new fruit nor marketable fruit of the current season. The Valencia grower is often like the dog who sees the reflection of the bone in the water, and in snatching at the pictured one loses the one in his mouth.

No one knows better than the writer of this paper that our knowledge of the internal mechanism of the tree is still deficient. It is practically impossible to measure the relative value of these factors in the production of quality and quantity in fruit. However, it is possible to avoid the extremes which have been indicated and which are liable to bring disaster.

Soil Improvement in Citrus Groves

By K. E. Bragdon, Winter Haven

There are at least three methods by which the lighter citrus soils of Florida may be improved, and by which reserve plant food may be stored and retained in the ground. The grower who employs all three of these methods will be one who produces fruit of the best quality and, in the long run, for the least money.

The first of these methods is by the growing and plowing under of leguminous cover crops. If one were a preacher he would be tempted to take advantage of the occasion to preach a sermon to this gathering, using as a text a passage taken from Mark Twain, which reads about as follows: "There has been a great deal said about the weather, but very little has ever been done about it." By substituting the words *cover crops* for the word *weather* this would make a fine subject for a sermon to the majority of our citrus growers. In spite of the fact that everyone knows that cover crops are of great benefit in securing better yields and profits, comparatively few are taking advantage of this knowledge in order to profit by it. Many and varied are the excuses offered as reasons why leguminous cover crops are not grown. Here are a few of them. "The seed costs too much money." The seed will not cost as much as the value of commercial fertilizer that will leach through soils lacking in organic matter, or even as much as the value of the nitrogen stored in the soil by the crop itself. "I waited until summer and could not find any seed." This is not an excuse but merely shows that the user is in the habit of waiting too long before getting into action. Seed for cover crops should be bought during the winter before the supply is exhausted and the price becomes high. "I tried once and did not get a good stand." One who is unwilling to try, try, and try again finds this world a tough place in which to live anyway. "It is too much trouble to plow under a heavy cover crop." "It is too much trouble to spray with a lot of high weeds in the grove." Those who are hunting for trouble can usually find it anywhere. "I am afraid of pumpkin bugs." It is true that pumpkin bugs are sometimes troublesome, but they may be controlled by watching for the development of young ones in late summer or early fall and cutting the crop before they develop into adults. Two excuses are indeed original and need no comment. They are, "The red bugs are too numerous," and, "I am afraid of snakes."

A second method of improving soils is by the application of organic materials

such as stable, dairy and poultry manures, and muck. Stable and dairy manures seem somewhat costly by the time one pays the freight, hauling and applying, but are a very good investment nevertheless. The supply is limited, but can be obtained in car load lots from Jacksonville and Tampa, and in smaller quantities from local dairies, etc., in many parts of the state. One application of five to ten tons per acre will give beneficial results for a number of years. Muck is valuable if one has his own source of supply near enough to be hauled without too much expense. Composts of manures and muck are perhaps more valuable than either material alone.

A third method of building up the soils is by the use of organic materials in commercial fertilizers. This statement will perhaps start considerable controversy, since some of our most prominent authorities advise against it, but is based on observations made over a period of years in various parts of the state. As a concrete example there is a grove in Polk County on average soil of the ridge section where nothing but organic sources of ammonia have been used for the last four applications, and very little inorganic ammonia used any time for the last three years. The fruit now being harvested is of the best quality ever grown by the present owner. The trees are in the best color and condition, and are loaded with a new crop. This grower, by the way, also grows leguminous cover crops and has applied stable manure. One of the objections voiced against the use of organic sources of ammonia in commercial fertilizers is that the action is too slow during dry or cool weather. Perhaps this would be the case if one were to change suddenly from strictly chemical sources to organic during such periods, but after the persistent use of the latter over a long period there will be a stored-up supply of decayed, available plant food that will carry on through any season. The extra price is another consideration. The difference in cost between a strictly chemical formula and one made up largely of organic materials will range from three to fifteen dollars per ton, depending on the particular formula used; but the actual value to the grower is believed to be far more than this; and those who have given the matter a fair trial have found that fewer tons of the organic fertilizer will be needed. One reason for this being that the materials are not soluble until after they have thoroughly decomposed, and as this process of decomposition is gradual there is at no time a great amount of soluble nitrogen present to be leached away by heavy rains.

It is very easy for one to tell people how and why to do certain things, but very difficult to get the message across in such a manner that it will arouse them to the point where they will really *do* them. It is only by *doing* things, rather than talking about them that actual results will be accomplished. To the grower who believes that his land is in such condition that it needs no improvement this subject will have no appeal, but if only a few of the many who know that their own groves need improvement are aroused to action by these few and rather inadequate remarks then this small effort will not have been made in vain.

Citrus Soils and Cover Crops in Osceola County Section

J. R. Gunn, County Agent, Kissimmee

Osceola County being at the head of the great Kissimmee valley naturally has varied soil types. In the extreme northwest section of the county is a portion of the ridge which extends through the central part of the state, a large portion of the groves in Polk County being planted on this type of soil. Going from this section toward the system of lakes that connect with the Kissimmee river and through it with Lake Okeechobee, are found low pine lands, high and low hammocks, flat woods, and muck around the lakes.

The older groves of the county are all on the hammock soils, being planted by the old settlers who found wild citrus trees growing in the hammocks, and naturally planted their seedling groves in the same types of soil. In the hammocks over the county can still be found sweet seedling oranges and grapefruit growing wild.

As development increased groves were planted on the low pine ridges which are found in three parts of the county and today a majority of the groves are probably on this type of soil.

Some groves have been developed in the high ridge section of the county and with this section now opened up to the world with paved roads, development is sure to go forward rapidly.

There are some groves on the true flat woods type of soil that are paying good returns to their owners. The two main items in their care being careful draining and a thorough system of cover crops to keep the soil loose and mellow. A flat woods soil without sufficient humus packs during rainy seasons and the roots of the trees are smothered.

Most people, it seems, have the idea that most of our groves are on flat woods soil but in reality they are mostly on the low pine ridges and hammock soils.

The growers who have their plantings on the lower types of soil will invariably tell you they much prefer it to the high soils, and give the following reasons: (1) When properly handled a better quality of fruit is produced. (2) Less fertilizer is required as the soils are naturally more fertile. (3) Cover crops are much more easily grown. (4) They are much easier to cultivate.

Cover crops to the old grower in this section did not mean much as there was plenty of humus in the soil. If he thought his grove needed any building up

or fertilizing he cow-penned a section of it at a time until the entire grove had been covered. He let the grass grow in the summer and cut it for hay or turned the cattle on it. Turning the cattle on it served the double purpose of putting the cattle in good shape to go into the winter, and did away with the grass, thus making it much easier to plow in the fall.

During recent years the number of cattle has decreased very materially, and the number of groves has increased. The scare some time ago about putting manure on citrus trees, stopped most of the cow-penning, and with the continual hay cutting depleted the humus content on the soils very fast. This put the grower to thinking about cover crops for soil building. Until three years ago when any crop other than grass was planted it was cowpeas as clean cultivation could be practiced until the rainy season in the summer and the peas planted then and be out of the way in time for early fall cultivation.

Velvet beans were too long in maturing and beggarweed was difficult to keep seeded under the existing system of cultivation.

Three years ago one grower secured a small amount of Crotalaria seed from the Agricultural Experiment Station and seeded a part of his grove to it. The next year he saved enough seed to plant his whole ten acres and sold quite a few pounds to neighbors. The growers over the county visited these plantings and were so favorably impressed with the condition of the groves in which it was planted that the year past over 140 acres were planted to it. From the demand there has been for seed this spring there should be over three hundred acres planted to it this summer. So far no grower who has planted Crotalaria has discontinued doing so, but in most cases are seeding every acre possible to it.

Crotalaria has its faults, but so far the growers in our county have found its good qualities to far outweigh its faults. It certainly puts nitrogen and humus into the soil and changes the appearance of the trees very favorably. Let us hope it continues to show up favorably as we need it in all sections of the state.

Citrus Fertilizer Experiments

R. W. Ruprecht, Chemist
Florida Agricultural Experiment Station, Gainesville

I am going to give you an outline of the various citrus fertilizer experiments that we are conducting, with a brief report on the results obtained to date. Please remember, however, that any statement of results is subject to change as further evidence or results are obtained.

The oldest fertilizer experiment is the so-called Dieback Grove at the Citrus Experiment Station at Lake Alfred. As the name implies this experiment was begun in connection with the study of dieback. As most of you know, five or six years ago it was generally believed that organic nitrogen was the cause of dieback. In order to prove or disprove this point as well as for other reasons which need not be mentioned, this experiment was begun in the spring of 1921. The grove covers ten acres and is planted as follows:

Eight rows of Lue Gim Gong oranges on lemon stock,

Eight rows of Pineapple oranges on rough lemon stock,

Five rows of Marsh Seedless grapefruit,

Two rows of Silver Cluster grapefruit,

Two rows of Dancy tangerines.

The grapefruit and tangerines were budded on rough lemon stock. The grove is divided into two series of five plots each. The sources of ammonia in the mixed fertilizer is as follows:

Plots 1 and 6—Nitrate of Soda.
Plots 2 and 7—Sulfate of Ammonia.
Plots 3 and 8—Dried Blood.
Plots 4 and 9—One-half Dried Blood, one-fourth nitrate of Soda, one-fourth Sulfate of Ammonia.
Plots 5 and 10—Stable Manure.

Plots 1 to 5 inclusive received their phosphoric acid from super-phosphate while plots 6 to 10 will receive it from steamed bone. The potash on all the plots is derived from high grade sulphate of potash.

To date no marked differences have developed. This past year the fruit from Plot 8 receiving its ammonia from dried blood, and phosphoric acid from steamed bone was rather rough skinned. The interior of the fruit, however, looked, tasted and analyzed as good as any of the other plots. The trees on Plot 3 seem to be somewhat smaller than the balance of the grove. Contrary to general belief the fruit from the manure plot

has been of just as good quality as that from any other plot.

The second oldest experiment is an experiment of high versus low potash fertilization. This is also located at the Citrus Experiment Station. This was begun in the fall of 1921 with trees about four years old, on a two-and-a-half acre grove—half Tardiff oranges and half Marsh Seedless grapefruit. This grove is divided into six plots fertilized as follows:

Two plots receive 3% potash in the fertilizer at each application; two plots receive 10%; one plot 5% and one plot 3% in the spring, 5% in the summer and 10% in the fall. All of the plots receive the same amount and kinds of ammonia and phosphoric acid.

To date we have not found any striking differences due to the various amounts of potash in the general appearance, taste and sugar and acid content of either the oranges or the grapefruit. Chemical analysis has shown that the fruit from the 10% potash plots contained more potash than the fruits from the other plots. Whether this difference would affect the carrying qualities of the fruit we cannot say at this time. We are planning a few tests on this point for next season. The results to date would, therefore, seem to indicate that we can use considerably less potash in our fertilizers.

The experimental grove contains the following varieties all budded on sour stock: Dancy tangerines, Pineapple and Valencia oranges, and Marsh Seedless grapefruit. The grove is divided into seven plots fertilized as follows:

Plot 1, potash from high grade sulfate three times a year,

Plot 2, muriate of potash three times a year,

Plot 3, low grade sulfate of potash three times a year,

Plot 4, high grade sulfate once, high muriate twice,

Plot 5, low grade sulfate once, high grade muriate twice,

Plot 6, high grade sulfate twice, high grade muriate once,

Plot 7, low grade sulfate twice, high grade muriate once.

All of the plots receive the same amounts of ammonia and phosphoric acid.

This experiment was begun in 1923 and the trees are now six years old. We have just harvested the third crop of fruit. The results to date, not including this year's crop, have shown no difference either in tree growth, yield or quality of fruit as determined by general appearance, taste or chemical analysis. Of course, it is too soon to make the broad statement that we can substitute the muriate of potash for the high grade sulfate. However, the results do indicate that you can safely substitute the muriate now and then when sulfate is too high in price. Should further crops show that the muriate can be safely used, it will mean a saving of about $150,000 per year in the citrus fertilizer bill. Nothing has been said in regard to the low grade sulfate of potash we are using. As some of you probably know this material also contains magnesium and was used to see if it would have any effect on the quality of the fruit. The above experiment is

being repeated or duplicated at the Citrus Experiment Station at Lake Alfred. This experiment has, however, been running only a little over a year so no results can be expected.

This covers the experiments under way with citrus in the citrus belt. We did have another experiment with citrus on muck soil at Davie, west of Ft. Lauderdale. The hurricane and subsequent floods about killed all the trees so the experiment had to be discontinued. We are in hopes, however, of again starting some on this type of soil.

In addition to these experiments we are conducting two experiments with Satsuma oranges in West Florida—one at Round Lake and one at Panama City. Here we are trying to determine how late it is safe to fertilize Satsumas and how much ammonia it is safe to use. The trees are just coming into bearing so no yield figures are available. It is noted, however, that the cold weather this past winter affected the high ammonia fertilized trees less than the other trees. We are planning to increase our citrus fertilizer experiments both with Satsumas and round oranges. We are planning to start an experiment to determine whether we can apply all of the phosphoric acid and potash in one application, applying only ammonia the remaining times. Or if we can cut down the number of applications to two instead of three. This, I believe, will be possible, on the better grades of soil, at least. Also, we are going to try and determine how much phosphoric acid a tree needs. As I have stated on previous occasions, I believe that we are using more phosphoric acid than is necessary. While the larger amounts are probably not doing any harm, they are costing money which the grower needs. We are also planning to make further studies on the potash requirements of the trees.

Many of you have probably been hearing and reading about concentrated fertilizers. I believe that the time is not far distant when we will be using fertilizers containing four and five times the plant food that our present fertilizers contain, thus making a considerable saving in our freight and handling charges. In order to be in a position to advise growers intelligently when this time comes, we are planning to start some experiments in the use of concentrated fertilizers on citrus in co-operation with the Bureau of Plant Industry of the U. S. Dept. of Agriculture.

As you have no doubt noticed none of our experiments have shown any striking differences between the different treatments. Ordinarily this would indicate that the experiment had failed its purpose. However, in our case the opposite is true. In practically all of our experiments we are trying to show that the new or different way of fertilizing your trees will give you just as good crops as you are now getting at a saving of cost to you. We will be satisfied, for instance, if we continue to get as good quality of fruit from the low potash fertilized trees as from the high or normal potash fertilizer. Likewise, we will be satisfied if the muriate of potash fertilized trees give us just as good crops of high quality fruit

as the sulfate of potash fertilized trees, or if the inorganic forms of ammonia give us just as good crops as the organic, or the combination of organic and inorganic now generally used. If all of these experiments show that the new way is just as good as the old it will mean a considerable saving in your fertilizer bill. I think none of you will object to spending any less money on your grove.

Member: What is urea?

Dr. Ruprecht: Urea is an organic compound made in Germany from atmospheric nitrogen, 46% nitrogen or 56% ammonia. While it is an organic compound it is almost as readily available as our inorganic compounds. It seems to have the property of not leaching as readily as the inorganic forms of ammonia.

Member: What is the basis of it?

Dr. Ruprecht: It is a chemical compound.

Member: Will you give us the appearance of a tree that needs phosphoric acid?

Dr. Ruprecht: I am unable to do so.

Prof. Drew: I notice that all the tags on our fertilizer state not more than 1% chlorine. Is there a law that requires that?

Dr. Ruprecht: Yes.

Mr. L. B. Skinner: Have you any experiments as to whether you can hasten maturity.

Dr. Ruprecht: We haven't any experiments on that point. There has been a theory expressed that sulfate of ammonia had a tendency to hasten maturity. In connection with our experiments we made an analysis of grapefruit for a period of three years, but we were never able to find that the sulfate of ammonia had any effect on maturity.

Mr. Poole: Why is grapefruit this year more acid than is usually the case?

Dr. Ruprecht: I don't know unless it may be due to dry weather.

Mr. Poole: Dry weather last fall?

Dr. Ruprecht: No, the present dry weather.

Dr. E. W. Berger: How does a tree appear that has too much phosphoric acid? Some years ago I entered a grove on the East Coast where the leaves had a peculiar sheen to them, and they seemed to look rather unnatural. The tree otherwise looked natural. We were told that they had been given an unusually large dose of phosphoric acid to hasten the ripening of the fruit.

Dr. Ruprecht: Do you know if the fruit ripened earlier?

Dr. Berger: No.

Member: Can trees with 10% potash resist the cold better than trees with 3%?

Dr. Ruprecht: I haven't any information.

Member: Have you any information of the effect of phosphoric acid on citrus trees?

Mr. B. F. Floyd: I am afraid not.

Mr. Richard Compton: I wish to ask how many years you expect to run that potash experiment?

Dr. Ruprecht: I can't say. I am not thinking of terminating it at any time soon. It will depend largely upon the funds available.

Citrus By-Products Utilization

Isabelle S. Thursby, State College for Women, Tallahassee, Florida

In discussing the topic that was suggested to me, I had first thought of preparing a long, thick paper on the subject of what has been accomplished with citrus by-products in the research laboratories of California, mainly. This was before I learned that Dr. Church was to be with us.

Most fortunately, you have gotten it first hand from Dr. Church. Now I shall confine myself mostly to a few points on the utilization of those citrus products which are most interesting and most important, from a nutritional standpoint, to the women in the home.

Magnificent opportunities exist for women in the state, in establishing and developing self sustaining, original industries that could make Florida famous for her canned goods, preserves, marmalades, and quality crystallized products. Although some women and girls have already made splendid utilization of our citrus fruits, the surface of the industry has scarcely been scratched. We have a varied and wonderfully attractive group of citrus fruits that combine into jellies, marmalades, spreads, crushes, juices, relishes, syrups, preserves, spiced and crystallized products that are not only beautiful, but better yet—both toothsome and healthful. Among the many interesting forms that can be used in citrus by-products are products that are unsurpassed in flavor and of a marvelous color and transparency — kumquat, limequat, orangequat, tangelo, pomolo, and pink shaddock.

I realize, of course, that it would only be in our big, main crop of surplus round oranges and grapefruit that the citrus grower, right now, is concerned in utilizing, but I say again, these other members, perhaps now in the novelty class, are of tremendous interest to our women and some day that interest will be taken into the commercial field. At the present time only a few of these products are known to the consuming public.

The kumquat, the smallest member of the citrus family, is fairly well known, and because of its hardy characteristics, may be found growing over the northern section of Florida. Their dense, branching habit of growth, attractive dark green leaves and golden yellow fruit, make them objects of beauty in any shrubbery planting, and we recommend them to be used for that purpose. Kumquats enjoy the distinction of being the only citrus fruit that is eaten whole. As you know, probably, the skin is spicy and aromatic, and the pulp delightfully acid. They make excellent preserves, marmalades, jellies,

and are an ideal fruit for crystallizing when used at the right stage of growth. This is very important for the best flavor and a good texture.

Of the lime group, may be mentioned several varieties of much interest and value to the preserve maker. Of these, the limequats, originating in the Citrus Experiment Station in Lake County, are, as the name indicates, a cross between the lime and the kumquat, with the color but none of the bitterness of the lime and all the piquant flavor of the kumquat. These limes work into delightfully "lemony" jellies, marmalades and preserves. If you were to work with the limequats, you would almost be inclined to think there was something mysterious or miraculous about their intensive, jellying properties. These jellied limequats, like sour orange preserves, are excellent to a degree that doesn't admit of any improvement—hardly—and will not until Mother Nature or Mr. Savage or Mr. Swingle produces a super-limequat.

But I don't believe they are thinking of any such probability and you wil be quite satisfied to take the limequat as it is, and not ask for anything finer. For in jellied limequats and sour orange preserves, we have just about reached the maximum of high-grade goodness. Only, I am sorry that Mr. Savage handed out the limequat and the seeds together—an oversight on his part, I am sure.

Another beautiful ornamental, also a member of the lime group, bearing a small tangerine-like, acid fruit of fine quality, is the calamondin. It is very hardy too, ranking with the Satsuma and the kumquat in this respect. There is also the Rangpur lime, well flavored and of a deep, orange color and of a better size than the Calamondin. These may all be used in the same way as lemons in the ades and for seasoning food. In fact, many think they are better than the lemon and more interesting, because of their high color.

But of all the lemons found in Florida—and they are many—the one that most delights the preserve-maker is the Ponderosa, a door-yard planting usually advertised by northern nurserymen for pot culture. They resemble a grapefruit in size and color, and the whole fruit, with its thick, clean-cut, lemon flavored peel, will cook beautifully clear and translucent under the skillful hands of the women who strive for quality and characteristic flavor.

While we reach out with one hand for these newer citrus relations, we certainly hold on tightly with the other, to the old and known favorites. For better far than all the newer generations together, is that member of the citrus family that was brought to Florida during the days of the early Spanish explorers, namely, the so-called Seville, or sour orange. As you know, this fine Old World Adventurer still furnishes the best root stock upon which to bud and graft; 75% of the world's output of citrus fruit being from trees on sour orange root stock. In addition to this, it is the only citrus fruit from which is manufactured the orange marmalade with such a "tang" and aftertaste as to have made England and Scotland famous in every corner of the globe.

If you will pardon a personal reference—may I say—I grew up in what was part of an unusually beautiful, wild grove, and one of the earliest recollections of the food of my childhood is that of the Dundee marmalade, served in my home in that orange grove on the St. Johns. Today, with sour oranges found growing very nearly all over the state (we have them growing in Tallahassee even), it is a sad pity that this delightful tonic, appetite and digestion-awakening marmalade is not served at breakfast in every Florida home. Sorry to say, however, such is not true.

As you probably know, the marmalade industry was first started in 1797 by a woman, Mrs. James Keiller, in the heart of Dundee, Scotland. This appetizing product immediately became a very popular table delicacy, and the demand was so stimulated, that Mrs. Keiller's husband went to London to superintend the selling of the product, which was then placed upon the market in that city. (This from the report of Consul M. K. Moorhead of Dundee, Scotland.) This incident in the early history of citrus by-products is very interesting. For people to have discovered and insisted, for nearly a century and a half, that sour orange marmalade may be both desirable and delicious. And the patient citrus fanciers are not through yet! Sour orange marmalade became so universally popular, back in the seventeenth century, that it enlarged into an industry of great proportion. Today there are some hundreds of manufacturers. But the place of its origin, Dundee, is still regarded as the home and center of the industry. The production from the various factories is estimated to amount to three thousand tons annually, and a considerable proportion of this amount is exported to the United States and Canada, Canada being the largest consumer. Even Florida promotes the use of the Dundee marmalade, rather than a product of her own make.

The product is put up in glass and in stone jars and also in tins. The largest factory in Dundee make their own tins in a modern tin shop, on their own premises, but most of the factory equipment is obtained from England and Germany. I am rather in favor of a greater use of tin. For, if people are going to have marmalades and "spreads," they should have none but the very best and they should have as much as they can get for their money. It is ridiculous to think that a high class marmalade cannot come out of a tin just the same as from a glass container. Glassware is so heavy that it costs more money to ship the glassware than the marmalade that is in it. When it gets to its destination people discover that they cannot eat glassware anyway, and it goes to the dump. That's why, instead of getting a twelve-ounce jar of marmalade for 50c or 60c, you should get fourteen to twenty ounces in tin for less. The only justification for charging more money would spring from the conviction that money is easy to get because the public is ready to turn it over to those who know how to go after it.

May I repeat this: sour orange marmalade from Dundee is sent to every corner of the globe. Florida could fur-

nish just as fine a product. Is not Florida asleep? Just when will she awaken to her opportunities and to the privilege of contributing products to the world's food supply that are not only delicious to the taste, but which, according to present-day research, abound in substances that are indispensable to the best nutrition. We would need to take a firm stand, however, to make it impossible for anyone to pack sub-standard stuff. For, when a housewife buys a jar of poor quality of marmalade, she is rightfully dissatisfied and is apt to condemn all citrus marmalades. The success of any business is founded upon the confidence of the consumer in that business, and many a glass of hodge-podge has been sent out under a fancy label that was not worth the price of the transparent shell in which it was shipped. That was a few years ago, we are not doing that in Florida any more, I think.

Candied or crystallized citrus fruit or peel is a product that deserves more attention than it has received—not only as a fancy confection, such as our women are interested in making, but as a wholesale product for the use of bakeries and the ice cream trade. It would seem as if this product should be carried along in connection with our grapefruit canners to take care of the extravagant waste of good peel there.

This preservation of fruits, also vegetables, by saturating them with sugar and then covering them with a coat of sugar crystals, is one of the oldest methods of fruit preservation known. Candied fruits have been used as a sweetmeat probably from the time that sugar became a common ingredient in a preparation of food for the table. It is well known that candied vegetables have been used for many centuries in the culinary preparations of Oriental people, notably the Chinese.

Because of the lengthy process in preparing the fruit, the excessive amount of sugar utilized, such a product must of necessity command a high price. In crystallizing, just as in other processes, the sugar mixtures, sugar concentration and temperature found best, must be maintained, if a uniform quality is to be secured. Of course, the quality of the fruit in the first place, determines the quality of the candied peel. It must be well ripened and full flavored, with all blemishes removed, never of green or prematurely colored fruit for a high-grade product.

There is considerable case-hardened, tough, dry crystallized fruit found in our markets, due principally, I think, to the fact that the process is not carried over a sufficient length of time. Far too much poor flavored, amateurish stuff is on the market, which tends to mitigate against building up a popular high-class industry. The slogan should always be "quality first."

The discovery of the existence of those little things which are called vitamins (the word vitamin means "life preserver," it means essential to life), was the work of several scientists, but they were christened by that warning name by a celebrated scientist by the name of Funk. Scientists have agreed that Funk did not

overestimate their importance when he called them by that name. It was time we were finding out something about them, for the health of the American people was, and is undoubtedly suffering from the fact that they were not and are not, being utilized in the diet as Mother Nature intended. We do not know yet exactly what vitamins are, or how to make them. But we do know that we must obtain them as we do our calories, from the grocer, not the druggist, and that we must prepare our food so as to conserve these vitamins, for some of them are delicate and easily destroyed. The Florida homemaker, throughout the year, finds the home demonstration forces all over the state constantly working towards the creation of an adequate conception of the importance of the vitamin content of the foods she serves in relation to the physical welfare of her family.

Among the most valuable constituents of citrus juices are the vitamins, so called vitamin A, B and C. For it is now known that vitamin A is found also in cold-pressed orange and in lemon oil, obtained by extraction with ether. It has also been recently shown that the outer oil-bearing portion of lemon peel and the alcoholic extract, made therefrom, contain vitamin B in such quantities as to make it comparable with yeast as a source of vitamin B. Work along these lines, however, has not yet been as thoroughly developed as the work in vitamin C, whose presence in the juice of oranges and lemons has been thoroughly demonstrated by many research workers for sometime. Because of its peculiar potency and indeed its indispensability in the cure and prevention of scurvy, vitamin C is known as the anti-scurvy, or anti-scorbutic vitamin.

While scurvy is frequently spoken of, and the expression anti-scorbutic vitamin is frequently used in discussing vitamin C, there seems to be no definite idea in the minds of many people as to just what scurvy is and how it affects the individual who contracts it. I shall not here enter into a discussion of the prevalence, effects and cause of scurvy, sufficient to say that there are still vast numbers of cases in the world today, with the most repulsive and distressing symptoms.

Priston, in his article in the Journal of the Royal Naval Medical Service, recommends a concentrated orange juice (manufactured in California), for adoption as the official anti-scorbutic for the British Navy. It being estimated that 50 gallons of the concentrate contain sufficient vitamin C to supplement the supply available in the British tropical war diet of 1200 men for three months, and that there would be a considerable saving annually by substituting the concentrated orange juice for the lime juice now issued.

There is a great need for concentrated citrus juices, preserved so as to retain their full vitamin content. It has been proven by a number of separate and entirely independent investigations that orange juice products can be highly concentrated or reduced to a dry powder form without appreciable loss of vitamin C. Copies of the research work on this particular problem are obtainable

from the University of California. This work should be of interest to the citrus growers of Florida.

We should be concerned, at least, in the milder forms of scurvy—incipient cases. Doctors tell us these are practically impossible of accurate diagnosis.

Minor pains, general inefficiency, greatly impaired vitality and usefulness, with increased susceptibility to all sorts of infections, are symptoms. These cases cause great loss of working ability and should warn each and all of us to include an anti-scorbutic of known value in the daily diet. There is no more reliable source of the anti-scorbutic vitamin than orange juice.

I would like to see an advertising campaign "Buy a Box" put on. Oranges and grapefruit, purchased by the dozen or less, forces the dealer to ask a price for them that frequently exceeds eight, ten and more dollars a box. Such prices discourage consumption and the only way to overcome such obstacles is to urge that they be bought in larger quantities. Tell the housewife and mother that intelligent buying will reduce the cost and that citrus fruit is so crammed with wonders, so blest with benevolence towards the human family, that the pantry in which they are seldom visitors, is not a pantry at all, but a branch office of the undertaker's.

Many states, the State of Florida included, as everyone knows, are flooded with soft drinks, masquerading under misleading labels. By far the majority of them are concocted of various chemicals, made up to have flavors resembling fruit juices, artificially colored, and some containing habit-forming drugs. These synthetic drinks have none of the virtues of the refreshing, healthful fruit drinks which they strive to imitate, and even if not actually poisonous, they are neither digestible nor very good, and they undoubtedly affect the health just to the extent that they are used.

A great many food errors do not always show up their effects immediately, but it is possible for these errors to store up trouble for a later day. With our growing population, consuming daily quantities of all kinds of fake fruit drinks, made synthetically, I think it is hardly the fault of the masses, that citrus fruit juices and other fruit juices do not enjoy many thousand times the present demand. The true fruit drinks have never been made known to them. Even those that desire them can rarely find them and, therefore, the consumption cannot make any headway. It would not take much originality to push these true fruit juices to the front, for it would only be necessary, in a way, to copy the successful methods of the manufacturers of scores of fake beverages, marketed today with striking success.

One enterprising state in the Middle West kept tally on the synthetic drinks sold in one week at their State Fair. They claim $50,000 from the visitors to the Fair from an average of two bottles to the person. Based on 5c per bottle the average annual expenditure per person for soft drinks may be estimated at $6.00 per person. There are one hundred and twenty-five million persons in

the United States and 125,000,000 times $6.00 makes $750,000,000.

Think of it, Citrus Fruit Growers! $750,000,000 for soft drinks, 90% synthetic, right here in a country where fresh fruit is grown year after year, and, at the same time, while the fresh fruit is sent to the dump in appalling amounts. $750,000,000 for soft drinks of little food value and few healthful qualities. $750,000,000 that these people, I believe, would rather spend for a real fruit drink if they could get it. Instead of coal tar dyes, synthetic flavors and chemical preservatives, let us substitute the golden fruit juices, that Florida can so abundantly supply.

Any captain of industry would tell us that the largest profits in his business accrue from the complete utilization of the waste products. The industrial chiefs would have nothing undone until ways and means were found to turn loss into profit. Florida should get behind her waste and make use of all her varied and interesting products.

We have already been shown many ways and means—and modern methods of utilizing sound, undergrade fruit. In a study of citrus by-products, you will be startled, perhaps, by the realization of the difference between the advanced ideas which come to us from the Pacific coast, as compared with the almost total lack of activity on the part of the balance of the country, including Florida..

Let us visualize, briefly, by-products other than citrus: pineapple canned fruits, walnuts, prunes, raisins, olives, lima beans, asparagus, salmon, tuna, and many in addition. Do you realize that on every one of these products, concerted action has been and is now being taken? On each of these articles, the brains behind the guns, have not trailed along, but on the contrary, are out at the head of the procession. All honor to—and most certainly may credit be given to California!

Gradings have been changed out there and are changing. To change is not a weakness—in California.

I am told that gradings of so base a food product as lima beans in the dry state is constantly being improved. The gradings of walnuts were entirely changed and they have brought the industry to a point where they are branding every walnut, and almost inconceivable detail. Fruit gradings were changed a short time ago. Raisin gradings were all changed recently. One must keep in step with these changes or be left behind.

In California, internationally famous research work has been done and still is being done in an effort to make canned goods free from harmful bacteria, thus preventing heavy losses. Many important canning problems have been met and solved, not only problems of value and interest to the big, commercial packers, but the problems of the women in the home have received equal attention. New outlets are constantly being sought for the always increasing surplus as the acreage in the fruit industry in California has been rapidly growing larger, just as in Florida hundreds of thousands of idle acres must be made productive.

In other states and other colleges, if both small and large canning organizations have found it profitable to maintain canning and research departments, would it not also be profitable for Florida, already with her various trucking centers, her interesting tropical and sub-tropical fruits, to do the same? Has not Florida her own problems of equal importance with those of other states to be solved? One of Florida's greatest needs just now is canning and conservation establishments. The future for canned grapefruit, an industry that is only in its infancy, is already bright with promise, but old processes need to be perfected, new processes discovered for making marmalades, crushes and spreads, juices and concentrates for ice-cream making as well as for household use.

In conclusion, may I say that never was the importance of eating and utilizing citrus fruits so marked as now, but before we supply New York and other markets with our fruit, let us remember that the best is none too good for the people within the state. First supply the home market with the juiciest, sweetest and best flavored fruit that Florida can produce.

Citrus By-Product Situation in California

C. G. Church, Laboratory of Fruit and Vegetable Chemistry
United States Department of Agriculture

Wherever citrus fruit is produced and marketed in any quantity, there arises the problem of the disposal of cull and off-grade fruit. That an attempt to sell this in competition with first-grade fruit is a mistake is believed by many growers and marketing men. On the other hand, the cost of growing this fruit is as great as that of growing good fruit, and the grower is most certainly entitled to some return on his labor and investment.

With the idea of helping to solve this perplexing question, the Bureau of Chemistry of the United States Department of Agriculture established in Los Angeles, in 1913, the Citrus By-products Laboratory. This laboratory studied ways and means of turning this cull fruit into profitable by-products, and, we believe, has stimulated and helped pave the way for the present activity in this field.

In 1913 very little in the way of citrus by-products was manufactured. In 1926 there was produced approximately 2,000,000 pounds of citric acid, in the form of either crystals or citrate of lime; probably more than 200,000 pounds of citrus oils, several tons of pectin, thousands of gallons of concentrated orange juice, and hundreds of tons of cattle food. The lemon by-products alone represent the utilization of 3,000 cars of cull and off-grade fruit.

In California about 15,000 cars of lemons are produced and the culls and off-grades from these constitute one of the chief sources of citrus by-products.

One of the first lemon by-products to draw attention was citric acid for the reasons that processes of manufacture were fairly well known and the market for it was established. This acid is chiefly used in the drug and soft drink trade. Practically all of it produced in California is manufactured at Corona by the California Fruit Growers' Exchange, which maintains at this place a central plant for the utilization of all the cull and off-grade lemons from its affiliated members. Some of this fruit is shipped from as far south as San Diego and from as far north as Tulare County.

Another by-product from the lemon to receive early attention was lemon oil. This article had been manufactured for a number of years and the market for it was firmly established. The largest users of it are the flavoring extract manufacturers, bakers and confectioners, and the drug trade. Both distilled and cold-pressed oil are produced, the former only when favorable combinations of low-

priced raw material and high-priced finished product exist. The pressed oil has long been manufactured by the Italians, but this is done by cheap hand labor which is an impossibility in this country. It was, therefore, necessary to devise mechanical methods which would turn out an oil that could be marketed in competition with the Italian product. This is accomplished mainly by crushing the fruit and then separating the oil from the resultant liquid by means of high-power centrifuges.

A more recent development in the citrus by-product industry is the production of pectin. As you all know, this has made itself well known, particularly to commercial jelly makers because of its power to cause jellying. At any rate, there appears to be an increasing demand for this product, and the research being done in this field justifies the belief that new uses will be found for it.

An entirely separate unit for the conversion of cull and off-grade oranges into by-products has been established by the California Fruit Growers' Exchange. Until last fall it was located in San Dimas, but lack of room to expand necessitated an entire new plant. This was built in Ontario only a short distance from the old location and at a cost of approximately $200,000. Here enough ground has been acquired and the building has been constructed in such a way as to allow for future expansion. A series of products, consisting of distilled and cold-pressed orange oils, orange juice concentrate and cattle food, are manufactured at this plant.

The juice of the oranges is burred out by hand operators on power machines and after concentration it is bottled or shipped in large lots in glass lined tanks. This concentrated juice is used mainly as a base in the soft drink trade. The peel is put through a special process by means of which the cold-pressed oil is recovered and the remaining oil obtained from the residue by distillation.

This final product resulting from the distillation of the oil is one of the interesting developments in the citrus by-products industry. It has been converted from a troublesome, offensive waste product, costly to dispose of, into an item of profit. Analysis of and feeding tests with this waste indicated some value as a cattle food. That it is an article of value is shown by the price—$3.00 per ton of wet material, f. o. b. the plant. This material is also dried in rotary driers and sold for chicken feed.

Although the California Fruit Growers Exchange is the largest single producer of citrus by-products in California, there are a number of other organizations which are playing their part in the utilization of cull and off-grade citrus fruit. Most of them specialize in a single product, like concentrated juice, marmalade, and peel candied and in brine. One of the largest of these independent organizations is the California Crushed Fruit Corporation of Los Angeles, the product of which is largely concentrated juice. When operating at full capacity, this firm uses approximately 60 tons of fruit per day.

Another large producer of juice is the Hyland-Stanford Company, also of Los Angeles, which processes in the neighborhood of 12 tons of fruit a day. This company has started to operate at Forest City, Florida, this season.

Naturally all of this development has not taken place without the expenditure of a very considerable amount of money, time, and effort. In order to keep pace, it will be necessary to spend even more.

The California Fruit Growers Exchange alone maintains, besides the control chemists at the by-product plants, a staff of five or six research chemists who investigate the possibilities of improvements in processes, development of new products, and the finding of new uses for those already established.

Now you will ask how much does the grower receive for this cull and off-grade fruit. Last year the Exchange returned to the grower $12.00 to $18.00 per ton, and expects in the future to be able to return more. This, no doubt, seems a small amount, but it gives the grower something and keeps this undesirable, off-grade fruit out of competition with his first-class fruit.

Member: How about grapefruit oil?

Mr. Church: Nothing has been done on grapefruit or grapefruit oil and so far as I know there is no market at the present time. The situation in California is not as pressing as here.

(A) Cultivation of Citrus Groves

(B) Crotalaria and Stink-Bugs

Wm. L. Drew, Eagle Lake, Fla.

My brother and I own orange groves lying side by side near Winter Haven, and while each has his own fruit, the groves are worked together. We started from the pine woods and the oldest trees are now nineteen years old. The land is high pine, and this quality of land is easily upset as to humus. The quality of the land is about average for the region. Richer lands and poorer lands are set to groves about us.

We first tried what now seems to us too much cultivation. We plowed usually in November, fertilized soon after and harrowed it in. No further cultivation was done until we fertilized again sometime in February. Then the harrow was run every ten days to two weeks until the summer rains began. We tried to fertilize again just before the summer rains began and having harrowed it in stopped cultivation when the first sustained period of wet weather arrived. Our cover crops were mostly beggarweed and native grasses, crab-grass predominating. As the trees grew larger it was increasingly difficult to make beggarweed grow. Sometimes, through mistake of judgment, the harrow was run too late and the cover-crop for that year was much injured in consequence. Under these practices our lands steadily lost in humus and applications of stable manure would have to be made every few years to maintain the trees in health.

Being dissatisfied with this we decided to try, on a limited scale, the opposite extreme of a Bermuda grass sod and no cultivation. The part of the grove selected for the experiment was set to Valencia oranges on rough lemon root and the trees were twelve years old when the Bermuda grass was set. The humus had been pretty badly worked out of the land and so an application of stable manure was made before setting the grass. For a period of four years this plot was not cultivated in any way. The grass was mowed from time to time, being left on the ground. Fertilizer was thrown on the grass. At first we used the same character of fertilizer that was being used on other parts of the grove, usually about one-half of the ammonia being derived from organic sources; but later we turned to inorganic ammonia. The quality of the fruit was much improved by this method; but the trees soon began to

look hard and starved. The foliage was sparse, the leaves small and much dead wood appeared. After the trees reached this state they ceased to set good crops. We tried to correct this by increasing the quantity of fertilizer and using four per cent ammonia at each application. The trees did not respond. We continued this until it became evident that they would not respond from this treatment. We then disked half of this plot at time of fertilizing, and in the course of time these trees began to look better and have resumed a fair degree of bearing. Finally we decided that total non-cultivation would not work on this type of land; and last fall we turned the whole plot over with the plow. Since then it has been disked or harrowed when it was fertilized and it will be plowed again at the beginning of the rains and then fertilized, disked and harrowed again.

Since the sod was plowed under these trees have shown marked improvement, have bloomed well this spring, and have set an excellent crop of fruit. The Bermuda sod has given the soil more humus than it contained when the experiment began, and there seems no reason to doubt that the trees will promptly return to a thrifty condition. We shall make no effort to eradicate the Bermuda grass; we do not wish to do so; but expect hereafter to plow it under in the fall and perhaps again in May or June. We hope that it may persist and flourish under this treatment; but Bermuda grass is not entirely at home on this type of land. During the period of this experiment we have had no severe drouth, but periods of normal dryness did not seem to affect those trees under the Bermuda sod any more than other portions of the grove. Indeed the most intense suffering from a severe drouth will be found in groves which have been over cultivated until the humus has been burned out of the soil.

I wish I knew just how far cultivation should go. We are all pretty much agreed that trees under four years old need frequent cultivation. The uncertainty lies with groves old enough so that fruit is more important than rapid growth of tree. High quality fruit cannot be produced without a goodly supply of humus and this is most cheaply supplied by adequate cover-crops. On our heavier lands this problem is much simpler than it is on high pine lands inclined to be sterile. As to such lands a little mistake in judgment as to character or quantity of cultivation, or an unfortunate hot and dry period following heavy rains which starts the cover-crop and then kills it, is tragic in its consequences. It is one thing to adopt a rule of procedure and quite another thing to wisely apply it year after year to varying seasonal conditions. Difficulty of application, however, is no ground for not formulating a plan.

I believe that we should either plow or disk in the fall. Where disking is feasible it is as good or better than plowing. It leaves the cover-crop better distributed in the soil and the resulting surface fertility is helpful in the starting of a new cover-crop. Where the land is exposed to high winds the sand will blow less where the cover-crop is disked in than

where it is plowed under. This is a matter of no little importance. The spring fertilizer should be either disked or harrowed in. I doubt if it is good practice to plow it under. We usually have enough rain in March and April to start grass and beggarweed seeds that lie near the surface of the ground, while those that lie deeper will not germinate. It is bad practice to try to start the cover-crop before the sustained summer rains come, and so these early grasses and self-seeding legumes will be destroyed. The harrow should take the place of the disk therefore, in these months, so as not to disturb the deeper lying seeds. Harrow enough to keep the grasses and weeds in subjection and the land in a mellow condition and no more. Every time you harrow you burn up your humus. If the rainfall subsequent to your last fertilizing has been enough to give the fertilizer to the trees, it is well to fertilize again in late April and harrow it in. You are then ready to start your cover-crop when weather conditions justify it. This will often come sometime in May; occasionally early in May. Just previous to the heavy rains, if a natural cover-crop from the seeds in the soil is depended upon, the land should be disked, so as to turn up fresh seeds, and smoothed with the harrow. Just when to do this will tax your greatest skill. When the heavy rains have come and the cover-crop has started, do not cultivate further. You will often be worried by subsequent dry weather which injures the started cover-crop. It may destroy the beggarweed, but usually the grasses will survive. Although they seem nearly dead it is astonishing how they will come on when the rains resume. Late cultivation usually means a poor cover-crop that season. If you have not fertilized until the cover-crop has started, wait until it is well established and then scatter the fertilizer without working it in. Never destroy a promising cover-crop in order to harrow or disk in your summer fertilizer. Sometimes with this lessened cultivation plan you may come to the rainy season with so much grass on the land that you doubt the wisdom of destroying it and starting again. An examination may show some well established beggarweed. If there is beggarweed seed in the soil you are pretty sure to get a much better stand of beggarweed by either disking or plowing again. By doing so your cover-crop will run largely to beggarweed. The other plan will give you mostly grass. Beggarweed and crab-grass delight in a well aerated, stirred soil, while Natal grass succeeds best when the soil is firm and un-worked. We have tried both ways and the suggestions here offered are the result of experience. We prefer beggarweed and crab-grass to Natal grass; but the latter is far preferable to bare land.

CROTALARIA AND STINK BUGS

We experimented with crotalaria, in a small way, for several years. The results were so interesting that last year we sowed it on forty acres of young grove. Some scattering beggarweed had grown on this land before. The humus had been pretty badly burned out of the

land so that beggarweed made a stunted growth. A light application of stable manure was spread on a rather small part of this land. We disked the land late in May, sowed crotalaria at the rate of about eight pounds per acre, and harrowed it in. Both crotalaria and beggarweed came up showing a good stand. On the richer portions of this land, and especially where the stable manure had been scattered, the beggarweed grew faster than the crotalaria, and in some places nearly choked it out. In other places of moderate fertility they grew side by side throughout the season. This was true also in one place where the fertility was good. In other places too poor for beggarweed to succeed, the crotalaria made a fair and very valuable cover-crop. In some very sterile places neither beggarweed nor crotalaria made much growth. It was evident that crotalaria would make a good growth on land too poor for beggarweed to succeed well and a very material growth on land where beggarweed would not grow at all. Crotalaria makes its main growth later in the year than does beggarweed. It grows rather slowly during the summer but makes a remarkably rapid and heavy growth late in the fall. On much of this land we got a good growth of beggarweed with the crotalaria not much in evidence until the beggarweed seeded and dropped its leaves; then the crotalaria came on and hid the beggarweed from view.

I sincerely wish that I could stop here on this report about crotalaria; but there is another side to it and with us it was bitter indeed. This crotalaria produced an abundance of pods early enough in the season. The young stink-bugs appeared rather promptly on these pods and were soon there in great numbers. We kept watching for good seed, but the seed all shriveled and turned brown or molded, and continued to do so until the plants were destroyed by the freezes of December 31st and January 11th. Practically no good seed was produced. Perhaps by diligent search one could find one seed in five minutes that looked as if it might grow. Why the seed acted this way is not clear to me; but I have thought that it might be due to de-vitalization from the attack of the stink-bugs. I have seen plants standing alone and not attacked by stink-bugs that produced good seeds in quantity in early fall, but I found no such case where the plants grew in mass. In the early part of November the crotalaria pods began to drop off much as bug-attacked oranges will drop off, and the bugs began going on to the trees. I had two rows of Valencia in this forty acres that were allowed to bear for the first time. This fruit was entirely destroyed by the bugs. They migrated in great numbers to the trunks and branches of those four and five-year-old orange and grapefruit trees and penetrated the bark for the sap. Gum would ooze out where the bark had been punctured until some of the trees looked as if they were suffering from a severe case of gummosis. Finally the bugs got their wings and flew to our adjoining bearing groves. Most of them stopped near the edge and collected on the fruit where they did much damage. They even attacked

Marsh Seedless grapefruit causing much of it to dry but not to drop. This is the first time that I have seen grapefruit seriously attacked.

Our efforts to protect the trees in this forty acres were without much success. We disked down the crotalaria next the trees both ways and then spread a canvas under a tree and shook and brushed the bugs from the tree on to the canvas where we killed them with paddles. This we could do readily enough; but in a few days the bugs were back again. They finally began dying and disappearing the latter part of December and on into January.

We had previously observed that crotalaria would produce little or no good seed unless it were allowed to stand until the next spring when it would produce an abundance of it. It was our desire to get seed on the ground that caused us to delay disking it down before the bugs had become numerous or had attained their wings. We were finally defeated in this, however, by the freezes which destroyed the plants that we had not disked down.

I am aware that what I have related is not a universal experience. We saw crotalaria growing on Merritts Island the last part of last December and were unable to find any stink-bugs either on the fruit or on the crotalaria. Why this was so I haven't even a theory.

Crotalaria is the most wonderful cover-crop on thin land that I know anything about and I much regret that the stink-bug menace is so great. One could disk it down in September without waiting for it to seed. By doing so, however, you not only lose its re-seeding, but also its best growth which is made after that time.

I wish to say further that after these pods dropped and the bugs left the plants, the plants revived, sent out new growth, and began to blossom again, and were getting ready to produce seed, when they were destroyed by the freeze.

Member: I would like to ask Mr. Drew whether there is more than one variety of crotalaria.

Mr. Drew: There are several varieties. The one most generally grown is the Striata variety, which I understand we have. I know at the Experiment Station at Lake Alfred there are three or four varieties.

Prof. Watson: One variety is considerably earlier than the other.

Mr. Drew: We had crotalaria growing where there was very little beggarweed, and the crotalaria was fearfully infested with pumpkin bugs. I don't know why the presence or absence of beggarweed would make any difference. I would like to ask others if they have observed the dropping of the pod after being severely attacked, and leaving the pumpkin bugs without adequate food.

Member: I have experimented with two varieties, and these stink bugs like both varieties equally well. Both varieties drop the pod immediately when they have

been struck by these pumpkin bugs. Otherwise they don't.

Mr. Drew: I would like to ask for the experience of some grower with a cover crop under large trees—what will grow the best in the shade?

Pres. Skinner: There is a cover crop that I saw growing at Miami under the trees, which will not climb the trees, but will cover the ground. I ought to remember the name, but I don't. I can get it later.

Member: There is one plant that will grow under large trees; it is related to the Poinsettia; it is in the Winter Haven section. It doesn't climb, and can be usually controlled.

Mr. Stoutamire: I think the Sarawak Bean grows under trees.

Mr. Drew: I don't think we ought to leave this subject. I am vitally interested in the question, and I want the experience of other people who have used crotalaria successfully without pumpkin bug injury.

Mr. J. R. Gunn: This crotalaria question has been discussed a great deal. We have never had the trouble in our section with pumpkin bugs that these gentlemen experience on the high ridge soil, with one exception. Grove became very dry, and the crotalaria stopped growing. The bugs disappeared and went to the orange trees.

One man hasn't fertilized his grove in which crotalaria has been growing but once in three years, and his crop has increased. If they use fertilizer they go ahead with the mowing machine, and cut the crotalaria high; if it is cut low, there is little re-growth, but if it is cut high it will sprout again, and set a good crop of seed before time for cutting it in the fall.

Recent Horticultural Developments in California

T. Ralph Robinson, Bureau Plant Industry, U. S. D. A., Washington, D. C.

At the last meeting of the Society I outlined for the members some observations I had made for several seasons past on the fruiting of avocados, especially as to their dependence on cross-pollination. This subject had received considerable attention in California in the last few years through the researches of Dr. A. B. Stout and Mr. Orange Clark. The results and conclusions of those two investigators were somewhat at variance and more recently several horticulturists of standing have stated that there was no real pollination problem in California. My recent trip to California was made in part to reconcile these views having a belief, founded on observation in Florida that both attitudes might be right, depending on the climatic factors influencing flower behavior.

The Fuerte variety has become almost the standard avocado variety for California, the trees of this variety now being planted probably equaling or exceeding the total of all other varieties combined. I therefore gave first attention to this variety. The spring was rather backward to observe open bloom in some sections but the trees were still holding fruit from the last crop and gave opportunity to draw some conclusions as to the practical importance of interplanting of varieties. The experience of growers was also, of course, sought at every opportunity.

The divergence of views above referred to seems to be readily explained by the climatic differences where the main investigations were carried on. Dr. Stout's work, while a visiting member at Pomona College Faculty at Claremont was confined to the foothill groves of that region. Mr. Orange Clark, working at Point Loma, a peninsula lying between San Diego Bay and the Pacific ocean, was dealing with a different set of climatic factors, a cooler, more equable climate which slows up the flower mechanism in such a way as to make self pollination entirely possible especially with the Fuerte variety. It is worthy of note that in the foothill region, I learned of a ten-acre Fuerte grove in a solid planting, that had been entirely dug up because of poor fruiting, yet along the coast where growth conditions are at all favorable there seems to be no serious difficulty in fruit setting even when there is no opportunity for cross-pollination. Even in the foothill sections in some seasons there may be brief periods of weather favorable to self-pollination and isolated trees may then fruit well, as I observed in several instances.

The situation is entirely comparable to that obtaining in portions of Florida. A single isolated Fuerte tree near Blanton has for several seasons past produced more fruit than a ten-acre grove in solid planting of the same variety near Lake Eloise.

A study of the flower behavior of the Blanton tree during the cooler weather up to late March showed overlap each day between the receptive and pollen-shedding flowers and fruit continued to set during this time. Early in April when flower studies were again made, this overlap no longer occurred and no more fruit was set.

In the ten-acre Fuerte grove at Lake Eloise, the flowers showed little or no overlap and set very little fruit at any time. A row of Spinks avocado came into flower for the first time, adjoining the older Fuerte grove, in the spring of 1924. One row of Fuerte next to Spinks set a full crop that season—the next row back had a scattering set of fruit, the third row had one tree (out of 12) with a few fruit, the fourth row and balance of grove was entirely devoid of fruit. The flower behavior of Spinks (Class A) fits it to reciprocate with Fuerte (Class B) and Spinks also fruited well, evidently benefitting by the close association. Thus it may be true in one situation that cross-pollination is not essential, and yet vitally important in other places.

It is significant that the large expansion of avocado planting in California is taking place in the southern counties along the coast, or near enough to get the oceanic influence. This expansion is very great I can assure you and plans are being made to make the avocado widely known in the Eastern markets and a year-round competitor with our other fruits. This expansion is temporarily slowed up, simply because the nurseries are sold out and trees are not to be had but the acreage already set, barring a serious disaster, will soon produce a crop that will be felt in the markets of the country. Standardization of varieties, grades and pack is being worked out largely through the California Avocado Association, which has adopted a trade name, "Cal-avo" for the avocado. Owing to different seasons of fruit setting in different locations and a long period of ripening, the Fuerte variety alone is shipped almost every month of the year from California, and may be called the Standard California variety. It seems to be as thoroughly adapted to the California climate as it is unsuited to Florida conditions, at least in the southern half of the state.

To suit market requirements Florida will need to have more varieties, no doubt, than California, (just as we do in citrus) and all the evidence on pollination indicates that the wise plan would be to interplant reciprocating varieties (of Class A and Class B) as listed in previous reports of the Florida Horticultural Society, 1925 and 1926, in order to get all the benefits possible from cross-pollination. The Trapp is the only Florida variety that gives evidence of being consistently self-fertile, and it supplies fruit only during the fall months. Furthermore, it seems to be adapted only to

a comparatively narrow range of territory on the lower East Coast.

In the citrus field in California the principal trend of interest to Florida fruit growers is perhaps the gradual increase of Valencia acreage at the expense of the navel acreage. There are probably several factors in this change, but one of the chief factors is the fact that the Valencias are chiefly marketed after the Florida crop is out of the way. The navel orange is especially subject to "June-drop" resulting in low production in some districts, a factor that has no doubt resulted in some reduction in area devoted to navel production. This increase in Valencia production of course means that more and more the early orange shipments from Florida, in October and November, are going to meet increased competition with the "hold-over" California Valencias, dead ripe and usually of good size. It therefore becomes especially important to plan fall shipments of oranges most carefully, to ship only palatable fruit of good size and color in order to hold the good will of the dealers and the consuming public. In the early navel districts of California, it has been learned that the Thompson navel, which originated as a bud-sport of the Washington navel, is from two to three weeks earlier in maturity than the true Washington navel, a difference great enough to allow much of this crop to go into the holiday markets. This fact is resulting in some new planting of Thompsons and the working over of lemons or Valencias to Thompson navel in districts better suited to navel growing.

Lemon Production in California for several seasons past has been in a position somewhat analogous to grapefruit in Florida—prices dragging for a good part of the shipping season, with good prices for only the best fruit and then only at periods of heavy consumption. The utilization of off-grades and "tree-ripe" fruit in the manufacture of by-products has been a life-saver for the lemon growers just as the grapefruit canning *promises* at least, to help out the grapefruit producers in Florida. If the markets can be relieved of the competition resulting from shipping low-grade and off-size fruit, the producer of good fruit, well graded and packed, should find a ready and profitable market for his output.

In the California lemon situation, in addition to low prices, there has been much concern over a poor tree condition that seems to be widespread and to present many puzzling features. In the weakened tree condition, much of the fruit ripens on the tree before reaching market size, a serious loss since these "tree-ripes" cannot be stored and must go to the by-product factory unless there is a strong market at the time.

For a time this condition was thought to be due to a series of dry years, but more recently suspicion has been directed toward the budding stock. When lemon growing was first begun on a commercial scale the stock commonly used was the sweet orange, until its susceptibility to gum disease finally led to the adop-

tion of the sour stock almost exclusively. On the sour stock, the older trees are now showing rather marked overgrowth of the scion, while trees of similar age or older on the sweet stock seem in better condition than those on the sour stock. The agitation against sour stock is not confined to the lemon top and many nurseries are now growing almost as many sweet seedlings for budding as sour, notwithstanding its admitted greater susceptibility to gum diseases. In fact, I was astonished to learn from the Fruit Growers Supply Company that they were securing this year to furnish to California nurserymen as many sweet orange seed as the sour orange; surely, a revolutionary change for a region solidly committed to the sour stock for at least two decades. With a better knowledge of how to deal with gum diseases and especially how to prevent the conditions favoring such troubles, the growers evidently feel fairly safe in reverting to the sweet stock with its greater vigor of growth and higher degree of apparent scion compatibility.

In this connection it might be of interest to give some figures as to the Growers Supply Company's service to the citrus nursery business in California. This company not only buys the seed in large lots, which seed comes almost exclusively from Florida, but also furnishes most of the budwood. About ten years ago when Mr. A. D. Shamel of the U. S. Department of Agriculture had first demonstrated the value of "Performance record budwood," budwood secured from trees of proven production, the problem presented itself of how to make this sort of budwood available to growers and nurserymen under conditions which would permit each lot to be safely certified. The California Fruit Growers Exchange took an interest in the problem and in co-operation with Mr. Shamel, organized a "Bud Supply Department" in their subsidiary organization, the Fruit Growers Supply Company. This organization has to date supplied the nurseries of California with about three million buds, each one of which is traceable back to an individual bearing tree of known production and quality. In addition to this number probably a million more performance record buds have been used by nurseries maintaining their own progeny trees and able to furnish a straight record of the source of each bud used.

This plan of securing buds calls for an elaborate system of record keeping and undoubtedly adds to the initial expense of tree growing, but in planting a grove what does it matter whether the shield bud costs one cent or six cents? The grower could well afford to pay many times that difference if he could always be sure of what he was getting. The uniform appearance of the progeny groves and the high average of fruit quality produced from such budwood is sufficient to warrant the continuation of this system in California.

As most of you know a Progeny Grove is in process of development at the Citrus Experiment Station at Lake Alfred with the object of affording in the future a reliable source of budwood from record trees in Florida.

Before leaving the subject of stocks for citrus in California I would like to make brief mention of one feature that is receiving considerable thought and experimentation not only from the State and Federal research investigators but from the growers themselves, that is—*vegetative propagation.* Occasionally in a grove, say a lemon grove where most of the trees are in poor condition and all on sour stock, a tree or several trees occur which are vigorous and where the bud union gives no evidence of incompatibility. How to get more stocks exactly like these is the problem—they seem to be the result of chance seedling variations or possible natural hybrids.

The simplest way seems to be to induce the roots to sprout and then to cut these sprouts up and root them in a suitable rooting bed. Some of these stocks fail to send up sprouts, however, even when roots are severed and exposed and then the only recourse is to try rooting piece cuttings of the root itself. This is much more difficult and usually fails unless very large pieces are used. A method of grafting a scion in the piece root, however, offers some chance of success even with small roots. This resort to vegetative propagation may look like a painfully slow process and is not at its present stage recommended for commercial practice, but it may eventually be the means of making available stocks of uniform vigor, disease-resistance and compatibility to the scion chosen.

Once a start is made with vegetative propagation, the very material that is now cut off and thrown away in a citrus nursery, viz., the top of the stock after the bud is healed in, would furnish the cuttings for the next season's budding stocks, so the method is not as impractical as it may seem at first thought. The Solar Propagation Frame, demonstrated by J. H. Jeffries at the last meeting of the Society affords a cheap and practical method of forcing fine twig cuttings to strike root.

California, with its great extent from north to south, its mountain ranges forming vast valleys isolated both climatically and topographically, lends itself to great diversity in horticulture.

One of the most recent fruit industries, just attaining commercial status is that of date-growing. It may be of some interest to Floridians to learn something of this infant industry even though it has no place in our horticulture, at least for fruit production. The date palm of course grows well in Florida, but requires a degree of heat and atmospheric dryness for commercial fruit production, not to be found outside of truly desert areas.

Although the first plantings of imported date varieties introduced by the U. S. Department of Agriculture, were made about twenty-five years ago in California, the development has been slow and faltering for many reasons. First it had to be learned what varieties (out of hundreds known to the old world) were adapted to the American deserts where

irrigation water was available; these varieties could be propagated only by rooting the off-shoots or base suckers from the bearing or female palm, a slow and at first a difficult process; and when fruit was finally secured, much had to be learned about handling and packing the fruit before the business began to look commercially promising. The whole business of date culture is a highly specialized field but so intensively has the date palm been studied by the scientists of the Department of Agriculture, men like Swingle, Fairchild, Mason and Kearney, that the old world is now calling on Americans to render them assistance in their difficulties and even to supply them with disease-free offshoots of their own precious varieties. Just now Dr. Swingle is en route to Algeria to attend a conference on date culture; two years ago Prof. Mason of our office was loaned to the Soudan government to advise the Soudanese and give them the result of American experience.

Last year the crop of dates in the Coachella Valley suitable for sale in the fresh state or packed, amounted to about a half million pounds. Besides this amount, there was probably two to three hundred thousand pounds produced in the Imperial, Yuma, and Salt River Valleys, and a considerable quantity of cull dates which can be utilized in various ways after seeding and shredding. When it is considered that our total imports, chiefly from Mesopotamia, amount to about seventy-five million pounds annually, the American production seems very small, but this production is increasing about fifty per cent annually and the output is of such a character that it readily takes precedence over the imported article. Not only is the American production limited to the finest varieties, seldom imported into the United States, but the sanitary methods of handling and packing alone warrant the buyer in paying a premium over the rather messy imported product. At present the principal packing date is the Deglet Noor or "date of the light," especially well adapted to the Coachella Valley. Later other varieties of almost equal merit, suited to other valleys having different climatic conditions, will come into production so that the American connoisseur will in time purchase dates according to his variety preference, as he now does oranges, apples or grapes.

A decided novelty to the American consumer will be the date known as the "bread date," dry and hard, capable of long storage and preferred by the Arabs to the best of soft varieties.

One high food value of the date renders this addition to the National cupboard of especial importance. There is a picturesqueness about a date orchard and fascination in overcoming the harshness of the desert that is destined to win for this infant fruit industry a unique place in American horticulture. For one thing the initial outlay in starting a date orchard is so great that it will attract only the man of some capital and a lot of determination, a willingness to go through the "burning sands" day after day while his precious palms are being brought to fruiting.

The desert sands are far from unpleasant in the winter, spring and late fall but during the fruit ripening season of August and September, temperatures from 110 to 115 degrees are not unusual and occasional maxima of 120 degrees or over are recorded. The lack of humidity, however, renders these temperatures much less formidable than they sound, and it is this heat that is necessary to develop the high sugar content necessary in a high grade packing date. The heat requirements differ widely with different varieties but that is a long story by itself.

I have here several sample packages of the Deglet Noor and the bread dates (Thoory) grown in California from which you may judge for yourselves something of the standard being set in date growing and date packing by American pioneers in date culture. In this newest field of horticulture as in the citrus field, American producers are destined to lead the world.

The Spraying of Citrus Trees on the Ridge

R. L. Westmoreland, Lake Wales, Fla.

The citrus spray season in the Ridge section of Florida generally starts with Lime Sulfur solution, one part to forty of water. It is applied from January first to April fifteenth to the grapefruit trees.

Some growers spray their grapefruit with Lime Sulfur solution, one to forty just before the growth starts and sometimes as strong as one to twenty. But as a general rule the one to forty is sprayed into the bloom to control citrus scab. The mites in general are beginning to appear and from observation they do not ordinarily endanger the young fruit very much, until after the fifteenth of April. So a good thorough Lime Sulfur spray, one to forty, not later than April fifteenth will give a good control of the mites and will control citrus scab for some growers.

Under ordinary seasonal conditions, citrus scab in the Ridge section does not attack grapefruit very much unless they are in a near ammoniated condition, or are rather young fast growing trees. In other words, a grapefruit tree that probably did not fruit the past year, but was fed just as heavily as the ones that did fruit heavily, are more likely to have scab. Most of us use the Lime Sulfur solution, one to forty, and we think a good control of citrus scab on grapefruit is obtained. However, if you will examine the dark green grapefruit trees that I have just mentioned as being near ammoniated you will see that the Lime Sulfur one to forty did not control the scab on them, but the more normal trees showed us a nearly perfect control.

For the time being most of the Ridge growers are not troubled with melanose control and probably will not be until some years to come as the trees are not yet old enough to be severely attacked with this disease. Now I do not mean to say the Ridge is free of melanose, for it is not, but I was just mentioning the fact that we do not plan a spray for melanose control as growers do in some other sections. Some few growers use Bordeaux mixture alone and in combination with oil, and by this method control citrus scab and melanose with the same spray.

Probably the worst pest we have on oranges to fight today is the citrus aphis, and so far there is apparently no efficient control. For the last few seasons, I have noticed that where the cultivation began early the growth came out before the aphis appeared in any great quantity. So far the growth usually gets by with only slight dam-

age, but the aphis arrives in plenty of time to do considerable damage to the young oranges. In spite of the aphis, the young oranges seem to recover and a very nice crop of fruit generally sets.

When is the best time to spray with oil? What is the best oil to use? Each grower has or will determine the best oil and time to spray and under his conditions he is generally the best judge.

From personal observation for the last five years, I find that when September arrives, the Florida red scale also makes its appearance. I find if you wait until September to spray, that it will take two good oil sprayings, three weeks apart to control it, and in the meantime your trees and fruit suffer considerable damage. On the other hand, if you spray with a good oil emulsion, one to sixty, not later than June tenth or fifteenth, you will not be worried to the extent of having to spray with oil again until the next June. The other scales, purple and chaff, especially the purple does a great deal of damage to our groves but the spray for the Florida red scale will take care of these scales along with the whitefly.

We must not forget the rust mites for they are never at rest and if you do not inspect your groves every week they will russet your fruit before you can realize they are even present. When your oil spray has been on a month you can probably safely dust or spray with some form of sulfur for rust mite control.

Some growers claim you can control rust mites with oil emulsion, but so far I have never been able to get over three weeks good control with oil, and if you only get three weeks control with oil, and then have to follow with some form of sulfur you run a good chance of burning some fruit if the oil is still present when the sulfur is applied. The average control of rust mites under the general grove conditions will probably be not over six weeks, from June to August and eight to ten weeks during the cooler months.

Prof. Drew: It came up several years ago with me that we dusted for aphids one night when conditions were very excellent, except the temperature. We had understood that the temperature must be rather high in order to get good results, but as I say the air was very quiet, and just the slightest drift over the grove, and the dust sat there for a long time. When I went back and looked at my registered thermometer at the house it was in the 50s, and we got very excellent results. The aphids were so nearly all killed that in a day or two you could hardly find anything alive there at all. I know this is contrary to some experience, but I thought I would report it for what it is worth.

Mr. L. B. Skinner: I have an aphid

story that may interest you on dusting at night. The first year the aphids appeared, I had a grove that was a rebudded grove, top-worked, and I believe one of the worst infested in the State; certainly the worst that Mr. Winston said he ever saw. I hadn't paid any attention to it; I thought it would take care of itself. In this I was mistaken. We fixed up our aphid dust and dusted them on a night that was very still. There was hardly a breath of air moving. You could go down the rows with the duster and it just enfolded those trees. One of my friends don't believe me when I say you could hear those aphids fall. Some of you have heard it snow, which was a good imitation of the falling of aphids. The ground was covered with them.

Plant Quarantine Legislation

(ABSTRACT)

Wilmon Newell, Plant Commissioner, Gainesville, Fla.

Mr. President and Members of the Society:

It is necessary for the State of Florida to have a new Plant Act. This comes about by reason of a decision of the United States Supreme Court on March 1, 1926, in the case of the Oregon-Washington Railway & Navigation Company vs. the State of Washington. This was a case brought by the transportation company to prevent the State of Washington enforcing certain regulations it had promulgated which prohibited shipment of alfalfa hay into Washington from adjoining states wherein the alfalfa weevil occurred. The case was decided in favor of the state by the Supreme Court of Washington, but upon being carried to the United States Supreme Court this decision was reversed.

The United States Supreme Court held that the right to promulgate and enforce regulations affecting interstate movements of plants and plant products was, by the National Plant Quarantine Act of 1912, lodged exclusively in the Secretary of Agriculture and if he did not act with reference to any particular subject that was evidence that no action was necessary. This was in effect declaring that the states were deprived, by passage of the National Plant Quarantine Act of 1912, of passing any law which undertook to in any way to regulate interstate movements of plants and plant products. To this extent, therefore, the Florida Plant Act of 1915, like many other state laws of similar nature, was rendered of no effect.

To meet the condition revealed by the United States Supreme Court decision, Congress in April, 1926, passed Senate Joint Resolution No. 78, giving to the states the specific right to regulate interstate movement of plants and plant products to prevent the introduction into the state of any injurious insect or plant pest when the Federal Government itself had not placed the same subject matter under regulation. Senate Joint Resolution No. 78 also specifically gave to the states certain other privileges in this connection so that the way is now open for the State of Florida to enact a law that is sound and upon proper legal basis.

Without such a law your State Plant Board can not operate effectively in affording protection to your

agricultural and horticultural industries.

A bill has been prepared and introduced in our State Legislature by Senator W. T. Gary of Ocala, and is known as Senate Bill No. 36. This bill was drawn by the Plant Board after consultation with many leading horticulturists and organizations of the state. It does not extend or enlarge the authority of the Plant Board. It creates no new positions and it does not increase any existing appropriations. It is a most important piece of legislation for the future protection and prosperity of your industries and it merits your very active approval and support.

What are Plant Diseases?

Dr. O. F. Burger, Experiment Station, Gainesville, Fla.

Mr. President, Members of the Florida Horticultural Society:

It certainly gives me pleasure to be with you this evening.

The question has always been asked "What are plant diseases, and when is a plant diseased?" A plant is diseased when it does not react favorably to its environment. You who have been here through the day and have sat and listened to the discussions on how to manage groves, have found out that plants may be diseased, with being attacked by an organism, either fungous, bacterial or animal.

If we do not fertilize properly, our grove is in trouble. The plants are diseased. If we do not cultivate properly the plants are in trouble. If the water table is too high, we soon find out that our plants are in an unhealthy condition. If we have a prolonged drought we soon find that our plants are diseased. A healthy organism, a healthy plant is one which adapts itself to its environment.

Now I am not going to go over the whole field of citrus culture tonight. I am not going to take up the cultivation of the citrus grove, nor the physiology of the tree, but I want to confine a few of my statements to a plant being in an unhealthy condition or diseased, and how the organisms work on the plant when that plant is diseased.

To every plant there are three fundamental parts—the root, the trunk and the crown. It is the business of the root first to anchor the tree in the soil. Secondly, it is the business of those roots to gather the mineral nutriments which have been dissolved in water, and take those to the tree. Those are the two great functions of the roots. If the roots are diseased, they rot off, and cannot anchor the tree to the ground, which means it has failed to accomplish its purpose. If the roots are unable to withdraw from the soil the nutriments and give them to the tree, the tree is in trouble.

It is the business of the trunk first to conduct the nutriment from the soil to the crown of the tree. Secondly, it is the business of the trunk to raise the crown of the tree from the soil, and push it up toward the sunlight. Also a third function is to take the food material, which is elaborated in the leaf, and conduct that to the various parts of the tree.

The crown has several functions. The crown functions first in elaborating the food material, or taking the carbon dioxide from the air, combining

it with the water, which has been brought up from the soil, and making starch. That is one of the first functions of the crown, or of the leaves in the crown. If you should take a cross-section of a leaf you will find that the leaf is made up of a number of cells, and in each one of those cells you will find a number of small, green circular bodies. It is those small, microscopic, green bodies which are capable of combining the carbon dioxide from the air and the water from the soil, and making starch.

We can readily see then that any environment which is unfavorable to the proper action of either one of the parts of the tree, causes that tree to become diseased.

There are, however, in the plant world, small microscopic organisms, which are parasites, which have not the ability to take the carbon dioxide from the air and water from the soil and combine them to make starch. Therefore, those organisms must depend upon something else for their food supply. Unluckily, for the citrus grower, some of those organisms have chosen to live on the citrus tree. Hence we have some of our plant diseases.

Let us take, for instance, the small organism which causes foot-rot. It is a small fungus, microscopic in character, which lives in the soil. It is incapable of making the food substance for itself, so it chooses to live on the citrus tree. The citrus tree has made the starch; it has also taken the ammonia and the various products brought in from the soil, and combined the same with the starch, and has made what we wish to call "protein."

Now this little organism which lives in the soil attacks those roots. It hasn't a hammer nor a chisel that it can cut the roots of the tree with, or drill a hole in them, but it has created for itself an enzyme. When it comes up against a piece of food material, it just secretes some of this substance and dissolves the food. It enters into the root, there dissolves the wood and bark, and finally we will see that the root is decayed.

You are all familiar in the citrus tree business with what we wish to term gummosis. I do not mean the psorosis type. There are several types of this gummosis. One type is caused by the organism that causes melanose. The organism begins to dissolve away the substance in the bark, and in the wood, making this gum, and at the same time destroying the living tissue.

The region in a trunk of a tree which is known as the cambium layer, a small layer of live cells, two or three cells deep, around the tree, and when this fungus has destroyed this layer of cells all around the tree, the tree dies at the top. So that is what is happening in our gummosis type of diseased citrus.

A few years ago; perhaps several of you still remember; it is perhaps too fresh in your mind—that most serious of all citrus diseases appeared in Florida, known as the citrus canker. The citrus canker is caused by a very small organism. Suppose you should take a piece of paper or wood about an inch

long; then you should cut that piece of wood up into about 25,000 parts. The citrus bacterium is only about 2/25000 of an inch long, a very small organism. This organism chooses to live on citrus. We find that it settles down on a leaf and no doubt gets in through the breathing pores on the leaf. There it begins to grow and multiply. The first evidence of disease is a dead, yellow spot. The little organism has produced its dissolving material, which I wish to call an enzyme. Inside of that leaf then, where the spot is formed, there is formed a great big mass of bacteria which escapes to the surface. These bacteria have attacked the chemical factories of the leaves, the little green plastids. The bacteria are incapable of combining the carbon dioxide from the air with the water from the soil, and making them into starch.

There are other types of organisms which work in our groves, and one type which works when perhaps we least suspect. I have reference to that fungus which causes more trouble than any one of our disease producing organisms. After we have spent eleven months of care on the fruit, we may have a wonderful crop. We go out and we pick those beautiful, golden balls, bring them into the packing house, wrap them in a piece of paper, put them into a box, and send them to the market, hoping that we will get enough in return to pay us for the labor which was expended in raising that product. But we do not realize that we have turned loose in our grove a crew who does not appreciate what citrus fruit is; they don't pick the fruit; they gather it. They simply go and rob those trees, just pull off the fruit; they don't care how they get it. They bruise that fruit; they put it in a box and haul it to the packing house. They are not very careful how they haul it either, just so they deliver it. It goes over the belts and it is packed, and all along the line there hasn't been a critical eye watching that fruit. So injuries have occurred; small indeed, because it does not take a large hole in fruit to allow a little spore to penetrate into the small holes. When you receive word from the market end, you find that there is some red ink, and that you have had ten, fifteen, twenty and as high as sixty per cent decay on account of carelessness. This fungus which is causing this decay is called green mold. This fungus enters through wounds, and if you want to keep your fruit in perfect condition until it arrives on the market, it is your business to see that the fruit is uninjured.

Member: I would like to ask if the organism is the same in gummosis as in foot-rot?

Dr. Burger: There are two distinct organisms which cause the foot-rot and which cause some types of gummosis. The organism which causes foot-rot may at times cause gummosis.

Member: What percentage of citrus food is taken from the soil?

Dr. Burger: That's hard for me to answer. I wonder if there are not some chemists who can give that analysis. There was for many years a discussion among ancient horticulturists whether it was water or air, or what it was that made a tree grow. In Russell's book "Plant Nutrition and Crop Production" on page 1, you will find the following:

"The view that water is the food of plants was tested experimentally about 1620 and convincingly proved by the very beautiful and satisfying experiment of van Helmont:

'I took an earthern vessel in which I put 200 pounds of soil dried in an oven, then I moistened with rain water and pressed hard into it a shoot of willow weighing 5 pounds. After exactly 5 years the tree that had grown up weighed 169 pounds and about three ounces. But the vessel had never received anything but rain water or distilled water to moisten the soil when this was necessary, and it remained full of soil, which was still tightly packed; and, lest any dust from outside should get into the soil, it was covered with a sheet of iron coated with tin but perforated with many holes. I did not take the weight of the leaves which fell in the autumn. In the end I dried the soil once more and got the same 200 pounds that I started with, less about two ounces. Therefore the 164 pounds of wood, bark and root, arose from the water alone.' "

Member: What percentage doctor, approximately is taken from the soil?

Dr. Burger: I hate to venture a guess, but maybe perhaps 99% comes from the air and the water.

Member: You say 99% from the air and the water. Then do you mean to say that from all our expenditure for fertilizer we only get 1%?

Dr. Burger: It might not be exactly 99%, but it's a very high percentage. The fertilizer which you put on the soil weighs very little; the ash content of your tree weighs very little indeed.

Mr. Richard Compton: I would like to ask—do I understand that the roots of the tree take the fertilizer and change it to the nitrate form before it can be absorbed?

Dr. Burger: No, it is taken in as nitrates. It must be changed to the nitrate form before it can be taken in.

Mr. Compton: The root does that?

Dr. Burger: No, the soil organisms do that, I believe.

The Control of Citrus Melanose

Dr. H. R. Fulton and Dr. F. A. Wolf, U. S. Bureau of Plant Industry, Orlando

The results of experimental work on melanose control, as conducted by the United States Citrus Disease Laboratory at Orlando have been presented at various meetings of this Society and have otherwise been made available to citrus growers by publication in bulletins and in the horticultural press. As a change from this practice we have therefore chosen at this time to gather and present the views and experience of representative groups of men who grow and market citrus fruit. This information has been elicited by means of a questionnaire covering eleven topics. This was sent to some forty persons and twenty-two replied. Each query will be given in turn together with a summary of the replies.

1. From the standpoint of the marketing agency is it desirable for the grower to control melanose? The answer was unanimously, emphatically and briefly yes. This question, by the way, was the only one on which there was no difference of opinion.

2. Dusting for melanose control, method, cost and effectiveness. Most growers had had no experience with dusting. Nine reported unsatisfactory results. It appeared that under certain conditions, with more frequent applications—at least three—dusting might possibly be effective. One estimate of cost gave 4 cents per box of fruit when three applications were made, 3 cents of which was for material and 1 cent for labor. Another gave 3 to 4 cents for two applications. It was suggested that the dust be applied only when the trees were wet with dew and by means of a power duster.

One of the difficulties appears to be in getting sufficient dust to stick on the trees to give adequate protection and to be equivalent to that given when sprays are employed. This might be overcome by more frequent dustings. At present dusting for melanose control offers an important field for investigation but cannot be recommended as a general practice with promise of assured success.

3. Pruning out dead wood for melanose control, method, cost and effectiveness. Four growers rely entirely on winter and early spring pruning of dead wood for melanose control. Ten recognize the helpfulness of pruning and several of these practice pruning and spraying. Seven condemn it as impracticable. One estimate rates pruning as 50 to 70% effective in melanose control. The lowest cost of prun-

ing good sized trees was 5 to 8 cents. Most figures ranged from 25 to 50 cents with an average of 35 cents per tree. The cost of annual light pruning was materially less than for the first pruning of neglected trees. One gave an estimated cost of 3 cents per box of fruit. The concensus of opinion is that best control follows the systematic removal of dead wood each season before the period of infection of young fruits. The three factors which operate against the general adoption of pruning as a means for the control of melanose are cost, the practical impossibility of removing thoroughly the dead twigs and branches, and the press of other grove operations during late winter and early spring. Naturally the pruning of large seedling trees is a much more difficult matter than the pruning of well cared for trees that have just come into bearing. Further the annual pruning of young trees at low cost will postpone or prevent the inevitable accumulation of dead wood to the extent that spraying must be employed. Observations show that recently killed wood is most likely to harbor the melanose fungus and that there is little chance of the fungus from the twigs which are on the ground being able to reach the tree.

4. Spraying for melanose control. Method, cost and effectiveness. Thirteen replies indicate that satisfactory results are being obtained by spraying, sometimes combined with pruning as an auxilliary measure.

Five are definitely opposed to spraying and the remainder have not had consistent results. One spraying with Bordeaux-oil, 3-3-50 plus 1% oil, is employed by practically all. The usual time of spraying is from the middle of April to the first of May; one reply gives the period from April 10 to 22, and two specify two weeks after blossoming. Several advocate leaving the trunk, lower limbs and tops of the trees uncoated to preserve the friendly fungi and others advise thoroughly coating the entire tree with Bordeaux.

Cost estimates per tree range from a low of 8 to 12 cents to a high of 16 to 20 cents; three estimates were given on a box basis as 2 to 5 cents. It is not always clear whether or not the cost of the follow-up oil spray is included in some of these estimates; in the higher ones it is stated that it is included. Several secured only partial or fairly good results, the majority secured satisfactory control. Only two gave estimates in figures, 60 to 80% control, and reduction of melanose fruit from about 50% to 1%. Three things to be watched are getting the spray on at the right time, making a thorough application, and following up with oil for insect control.

5. Prevention of insect increase after melanose spraying. All replies indicate the need for an oil spray following the use of Bordeaux-oil. June is the preferred time. One prefers to start this work in May, and two indicate early July. One sprays when the scale crawlers can be seen under the magnifier. Three state that two oil sprayings are sometimes needed. The cost of scale control is reported by two

to have offset the profits from melanose control. Three special points are mentioned, that it is best to have scale cleaned up ahead of the Bordeaux-oil application, that scale increase need not be serious if the Bordeaux-oil is well prepared, and that directing the spray at the fruit and foliage, leaving the trunks and larger limbs unsprayed, lessens the chance for later insect increase.

6. Spray injury. Is it of sufficient importance to deter from spraying? How can it be avoided? Four consider that the risk of spray injury is too great to justify the spraying. Six have had no injury, twelve have suffered some injury, but consider it worth while to spray in spite of this. The following suggestions are made to lessen or avoid spray injury; test each tank of spray to determine if copper is neutralized; use extreme care in selecting materials, in mixing, and in applying; do not use oil spray when temperature is over 90° F., confine this work in hot weather to early morning and late afternoon hours; use a neutral white oil; add a spreader, such as calcium caseinate or whale oil soap; omit the oil from the Bordeaux-oil melanose spray. This last may be justified if especially close watch is to be kept on insects, and the oil spraying for them made promptly and with extreme thoroughness. Small acreages and those in which scale insects are already under good control by oil spraying are best suited for the use of the plain Bordeaux, which seems to be safer from the spray injury standpoint than the combination of Bordeaux and oil.

7. Melanose control in relation to decay during the shipping season. Eleven replies indicate that control of melanose cuts down stem end rot; the others have no observations on this point. No definite figures are given. Our own experiments have shown that pruning out dead wood reduces the chances for the Diplodia form of stem end rot much more decidedly than it does the Phomopsis or melanose form of stem end rot, while Bordeaux-oil spraying has a reverse relative effectiveness against these two forms of stem end rot. Neither pruning nor spraying as practiced for melanose control completely eliminates stem end rot, and the net effectiveness of either measure will depend on the relative proportions of the two forms of rot present. In general one may expect the reduction in combined stem end rot to run between 25 and 50% for either pruning or spraying, and about 50 to 60% when both of these control measures are carried out.

8. Melanose spraying in relation to ammoniation reduction. The answers are about equally divided, between no observations made, doubt that there is a relation, and a positive statement that there is benefit through reduction of ammoniation. One states that an ordinary spraying equals a one half pound per tree application of bluestone to the ground. Another regards Bordeaux spraying as six months quicker in results than broadcasting

bluestone. Another prefers working the bluestone into the ground. One mentions an indirect protection against blue mold which is likely to develop excessively in ammoniated fruit.

9. Net profits to the grower from controlling melanose on oranges, on grapefruit. Unfortunately eight give no reply, or state that they have no data. Only one indicates that no profit was realized, and in this case severe scale infestation necessitated two follow-up oil sprayings, and this resulted in oil injury. One had melanose so completely under control that there was no basis for comparison. Eleven indicate a satisfactory profit. Eight estimates are given in figures, starting at 25 cents per box, and going equally to 50 cents and 75 cents for an upper limit. No special distinction is made between profits on oranges and on grapefruit, except that in the latter case freedom from melanose may often mean the difference between saleable and unsaleable fruit. Doubtless some of the figures are for differentials in sale prices or returns, and may not have had proper deductions for costs of melanose control or insect control. The gain is stated to be in quality of fruit, freedom from decay, greater production from trees in better vigor, and less tendency to droppage of fruit. There is a general opinion that the fruit is raised one market grade by following proper and effective measures for melanose control. After contemplating the difficulties that beset the way of the pruner, and more especially the sprayer, it is gratifying to note that in the end there are so many who obtained substantial and satisfying money returns from controlling melanose. Our own estimates, based on careful grade counts for sprayed as compared with unsprayed fruit and average market returns for the several grades indicate something like 15 to 25 cents net profit per box for the whole crop after deducting all costs of control. Naturally the largest profits are possible in groves that are subject to melanose in greatest amount.

10. What should be done for melanose control under conditions existing this season? The answers are evenly divided between the three alternatives of pruning out dead wood, spraying with Bordeaux-oil, and combining pruning with spraying. Emphasis is placed on prompt and thorough removal of dead wood, cutting well back into sound wood. There is a general expectation that melanose in all probability will be abnormally abundant this year as a consequence of the abnormal amount of recently killed wood and that bright fruit will be at an extra premium.

11. What system of grading brings the best returns to the grower who controls melanose and produces a high percentage of bright fruit? This question was directed primarily to those engaged in the actual marketing of the fruit. The main question is whether it pays better when there is a high percentage of bright fruit; to sell this separately or to mix it with lower grades in a grove run pack. Five indicated that the brights ought to be

put in a separate pack, two favored a straight grove run pack. One favored grove run pack for fruit running less than 30% brights, and a bright, golden and russet pack when 50% or more of the crop is bright. The grower who puts time, thought and money into the production of bright fruit, and who faces all the uncertainties of the outcome is entitled to all the premium that such fruit can be made to bring on the market. The question of how to grade the fruit to secure this end deserves most careful consideration.

This review of the present status of melanose control shows that there is still much to be done in devising more satisfactory methods for melanose control, in making improvements on those now in use, in determining more accurately the costs and the profits of control measures as now practiced, and in critically studying grading and marketing practices with a view to making the profits of the grower larger and more certain. It would be a good thing if a larger number of the members of this Society would keep a careful account of the costs of producing fruit of superior quality and of the profits obtained from its sale. This means not only knowing the cost of the special grove operations per box of fruit produced, and the difference in market returns for the several grades of fruit, but also the degree of control secured as measured by the number of boxes advanced one grade or two grades or saved from the cull pile.

Our appreciation is expressed to those who have aided in this survey, which is intended to be an introduction to a discussion from the floor that will bring out the experiences of others on this problem.

Member: I would like to ask the speaker if the treatment for anthracnose on limes would be the same as for melanose?

Dr. Wolf: I have had no experience, but I understand its very difficult indeed to spray limes sufficiently often with any material to prevent anthracnose. The limes from the laboratory were sprayed once every week or ten days, and we did not succeed even with this frequent application to control the disease.

Mr. Waldron: How do you handle the grapefruit groves?

Dr. Wolf: I don't know, sir. I can venture an opinion. The organism which we regard as anthracnose was present this spring on the leaves and on fruit, but my experience has been that the fungus did not come except on the side which was actually frozen, and only on the leaves, so I didn't regard its occurrence on fruits or plants of that type as any material source.

Dusting of Citrus Trees

Max Waldron, Horticulturist, Citrus Grove Development Co.
Babson Park, Fla.

No citrus grove operation of importance has been more rapidly and generally adopted than has the dusting of trees for the control of rust mites. Until four years ago the standard method of accomplishing that work was by spraying with lime sulphur solution throughout the year, which entailed great expense and delay and also destroyed much fruit by burning.

Today the majority of growers, in Polk County at least, rely for rust mite control, upon the power duster using finely ground sulphur. Without this method the grove caretakers would have been unable to profitably cope with the ubiquitous rust mite on the large acreage which has recently come into bearing. With all other grove care costs rising as they did during the recent years of Florida's rapid expansion, it is fortunate that in one field at least the cost of care has been reduced, and with no unsatisfactory results.

Our conclusions resulting from the methods and results herein discussed are gained from very extensive dusting operations conducted for the past four years on fifteen hundred acres of groves at Babson Park in the Ridge section. We enjoy no immunity from rust mites such as some of our East Coast friends claim for themselves.

In working out on these groves what we consider the most satisfactory method of rust mite control, we have become a staunch supporter of dusting but at the same time, refuse to abandon the practice of applying one spraying of lime sulphur shortly after the petals have fallen.

Another advantage of using the lime sulphur spray in addition to controlling mites and scale crawlers is that nicotine sulphate can be added and this will get the aphids, at a less cost, than the dusting. These advantages, coupled with the fact that lime sulphur used in April controls the rust mite until at least the middle of June, and with no burning effect whatever, makes us believe it is too valuable a spray to be discarded. After applying that, however, we are successful in further controlling the rust mites with rarely more than two dustings.

We believe our greatest success is due to the fact that we put the duster in the grove before the rust mites become numerous enough to find without considerable searching. If the

mites are abundant enough to be detected without the use of a glass, it is usually too late to secure good control.

One reason for insisting upon this April lime sulphur spray is largely because of the additional control of red spiders and scale crawlers which the dust fails to give. There is scarcely any spectacle worse to view than a grapefruit grove in April, suffering from a bad attack of six spotted mites.

In this connection we wish to call your attention to the great disparity of opinion regarding the value of lime sulphur in controlling scab. According to Winston under laboratory conditions it gives 50% protection, due to its mildly fungicidal properties. We believe, however, that in a commercial way at least, there is little if any scab control to be had from an application of lime sulphur for the reason that the effects are not lasting. Outbreaks of scab have always been light in our groves, which in the past made us feel our annual lime sulphur spray had done some good in that respect. On the other hand, an occasional rankly growing grove will show heavy infestation despite the protection of lime sulphur. We believe more educational work should be done in this particular field, with the idea of clearing up the minds of many growers. Many insecticide salesmen lead the growers to believe that lime sulphur is a real preventative of scab and thus much inferior fruit results.

As a basis in securing figures representing the cost of sulphur dusting, I have selected one grove, consisting of ten acres of grapefruit, fourteen years old, which is typical in every respect and represents the average grove of that age in our territory. This grove is located one mile from water and has always been expensive to spray for that reason. The cost of rust mite control in this grove during the year 1926, was as follows:

April 22, Lime sulphur spray	$ 92.84
June 23, Sulphur dusting	22.65
Aug. 10, Sulphur dusting	22.50
Total,	$140.99

The total cost of dusting was $45.15. An average of slightly less than one pound of dust per tree was applied each time, with a standard power duster going up one side of each row. The type of dust used was a 95-5, i. e.: 95% of sulphur and 5% of lime. The dusting was always done in the day time.

The first picking in this grove consisted of 800 boxes which graded 308 Brights, 327 Golden, no russets, and 167 choice, due to thorn scratches. The fact that there were no russets at all demonstrated the effectiveness of dusting because the first dusting was done in June which is the banner rust mite month.

The total cost of rust mite control in this grove figured 3½c per box, or 26c per tree. This cost would have been over twice as much had we depended entirely on a lime sulphur spray, provided our experience in previous years repeated itself.

This system of an April lime sulphur spray, followed by two well timed dustings, has for three years, given us practically complete control of mites. In fact one grove thus treated furnished us with fruit which won the blue ribbon in the Polk County exhibit at the South Florida fair in Tampa this year. In looking over the results of the first pool of grapefruit, I find nearly 99% of our fruit graded Brights and Goldens.

In the matter of dusting for scab and melanose, with copper lime dust, we confess we are still in the skeptic class. This dust no doubt is effective against fungus diseases on pubescent leaves such as cucumbers, squash, etc., but it fails to adhere well to the extremely smooth and glossy grapefruit leaves. The chief objection to the use of it, however, is that even in certain cases where it does adhere there is not enough copper deposited to materially prevent the growth of fungi. In other words it is not possible to apply the dust thick enough to cover the leaves thoroughly. It is estimated that it would require four successive dustings to get as much copper on the trees as would be done by one spraying. The greater success by the vegetable growers in the use of copper lime dust is accounted for by the fact that they make repeated applications and also because the object they are dusting is so small it gets the full force of dust from the machine. This is manifestly impossible with large citrus trees.

Our own experience with copper-lime dust has been admittedly slight, but upon inquiry among those who have used it we fail to find any enthusiastic response. When some more successful adhesive or method of application is discovered, it is possible we may have better results to report.

Another type of dusting which has of necessity become widespread is that of dusting for aphis with nicotine dust. This has been successful where used when practically no air currents are moving but unfortunately this favorable time occurs so very rarely that it becomes very difficult to effect thorough control. As before stated we meet with best success by adding Blackleaf 40 at the rate of one quart to 200 gallons of water, in our April lime sulphur spray. By doing this we can reserve our duster for the more heavily infested areas.

Being in a particularly favored section so far as frost danger is concerned, we prefer to combat the aphis by forcing out our spring growth as early as possible. By so doing we find we are often able to beat the aphis. However, we would be quite uneasy if we did not know we could start out with a duster at a quiet time, and in a measure, subdue aphis in the worst infested areas. Having depended, for four years, upon dusters for producing bright fruit, and for subduing the aphis, we confess we would feel handicapped without them. With rust

mites breaking out all over the property at once, and multiplying so rapidly as they do, it would be virtually impossible to produce the grade of fruit we do by relying upon spray rigs. We consider the power duster a necessity on any bearing grove of 40 acres or more in size.

The Citrus Aphid Situation

J. R. Watson, Experiment Station, Gainesville, Fla.

Again this past winter nature has given us a valuable lesson on the best way to control the citrus aphid. In December there was every indication that we would have a heavy infestation of aphids in our groves this spring. There was distinctly more aphids in the groves than in December 1925. But the drought beginning in December and running into January did much to get the trees into a dormant condition. Then on December 31 and particularly on January 11, 12, and 16 came the freezes of the past winter which destroyed practically all new growth on which the aphids could feed except in some particularly favorable situations. Very few of the aphids were killed directly by the cold. All our experience with the citrus aphid shows that they will stand fully as much cold as the citrus tree. But, by killing out all tender growth, the great majority of the aphids were starved to death.

Many growers too, helped in this destruction by dealing with all young colonies seen on their trees. The result was that the first flush of growth which was early got by with practically no damage from aphids. Even tangerines did not suffer severely. There is still danger for young trees, particularly those severely injured by frost. The few leaves that they are able to put out must not be severely infested with aphids or many of the trees will die. But in general the fight is probably over for this year. The first flush of growth came early and it is quite possible that there may, on many trees, be another flush of growth before the hot weather, humidity and heavy rains of late spring and summer check the development of aphids. But the lesson that we wish to emphasize particularly today is that a thorough cleanup of aphids during the winter will so reduce their numbers that they cannot become sufficiently abundant to severely infest the first flush of growth. What nature did this winter with the help of some of the growers, the growers themselves can do other winters. That is thoroughly clean up the groves during the dormant period. If this is done the experience of the past two winters has demonstrated that the grower need not fear much damage to the early spring growth. The fortunate part of this is that from the standpoint of aphid control each grove is independent of surrounding ones during the winter and early spring. This is because the aphids do not fly around to any extent until the growth begins to harden on the trees.

This year scarcely a winged aphid was seen until about the middle of March and the growth was earlier this year than usual. Therefore, each grove owner will get the full value of his cleanup independent of what his neighbor does. The old threadbare excuse of many growers for doing nothing to their groves, "because my neighbor over there will not do anything and there is no use of my doing anything as the insects will fly in from his grove" cannot be used in the case of the citrus aphid in the early spring. By the middle of March a large number of the aphids began to produce wings and practically all the groves having any growth showed infestation, no matter if they were miles away from other groves. We expect to get a little more definite data as to the distance to which the aphids may fly, but evidently the winged individuals fly long distances.

What is the probable future of the citrus aphid? Have the aphids died down permanently or may we expect years with the heavy infestation of two and three years ago? Of course no one can give a positive answer to these questions, but in my own mind I feel that as sure as we have another open winter, free of severe frosts, a winter with good growing weather such as we had two and three years ago; we may expect a heavy infestation of aphids in the spring where the growers take no measures to combat them during the winter.

Let us go into a little more details as to the best methods of cleaning up a grove during the winter. A grower should begin the fight against aphids in the fall, by November at least. At that time everything consistent with good grove practice and the health of the trees should be done to get the trees as dormant as possible. We need not, at this time, remind the growers that this is the only safe thing to do. The frost experience of the past winter has sufficiently emphasized that point. I believe we are on pretty safe ground when we say that late fertilization with quickly available nitrogen or cultivation in the late fall is apt to stimulate growth if the weather should be warm and moist, and is an unsafe thing to do. On the other hand trees should not be starved, especially in the early fall, as a half starved tree is more apt to be putting out shoots at abnormal times as well as being more susceptible to frost injury.

However in spite of the growers' efforts to get the trees dormant, individual trees here and there, which are most likely to be young trees, are apt to put out some growth during the winter if the weather is warm and the soil moist. The aphids on these must be destroyed. Usually this spasmodic growth early in the winter on young trees occurs out on the ends of the branches. In such situations the easiest and quickest way to deal with a colony is to dip the branch in some good strong insecticide. A good strong solution of soap and nicotine sulphate or 5% extract of Derris is to be recommended. Later in the winter when young growth starts on the trunk of a

tree or in the interior where it cannot readily be reached by dipping, the grower will have to resort to other means. If there are only a few trees showing growth and aphids the grower can resort to spot dusting with nicotine sulphate-lime dusts, providing the weather is warm, about 60 degrees at least, and there is little or no wind. If any considerable number of young trees are infested the best plan is to dust the trees under tents, as our experience has shown that this gives the most thorough kill of any method of dealing with aphids.

Let us then, do everything practicable to get our groves thoroughly dormant in the fall, in order to starve out the aphids, and destroy all aphids seen during the winter. Then as early in the spring as we dare from the standpoint of danger from frost, push the trees by means of fertilization and cultivation and irrigation, if possible and needed, with the aim of getting the first flush of growth and blossoms out before the aphids can multiply sufficiently to do material damage. And remember that the aphids are exceedingly rapid breeders. Mr. Miller working at Lake Alfred has already run 40 generations since August last. He will probably have over 50 generations by the time the year is up. During favorable weather, a female (and except for a few males produced during the winter, all the aphids are females) produce an average of five or six young per day.

In the above discussion we have omitted all reference to hosts other than citrus. Of these we have found but one that is likely to be much of a factor in carrying the aphids over during the winter; that is the native host of the insect, the shrub *Spirea*, of which the most common species planted in Florida is the bridal wreathe. Fortunately there are no wild spireas here. This bush is a menace in a citrus community as aphids can live on its mature foliage and even stems. They do not, as in the case of citrus, require new foliage. The result is that they can live and breed continuously on Spirea. In the northern part of the citrus belt they have laid eggs on Spirea every year since they have been under observation. During other years the eggs failed to hatch, but Mr. Tissot, the Assistant Entomologist of the Experiment Station, observed that they hatched this year. Workers of the apple aphids have noted that if a warm spell occurs shortly after the egg is laid it results in the death of the embryo inside of the egg. This is probably the cause of the failure of the eggs of the citrus aphis to hatch during most seasons. Spirea bushes should be destroyed; leastwise all in the citrus belt as they may well result in carrying the aphids through the winter when there is no growth on the citrus. As an alternative for destroying the bushes they might be sprayed with a 1% oil emulsion to each 800 parts of which one part of nicotine-sulphate has been added. This will kill not only the aphids but the eggs and thus result in a thorough cleanup. Of course the spraying must be thoroughly done.

Perhaps the next most serious host plant of aphids are pears. There is sometimes young growth on pears when there is none on citrus. Eggs are also laid on pears. It is an excellent idea to give pears a spray of oil emulsion during the winter to kill San Jose scale and the addition of nicotine-sulphate as outlined above will kill any aphid eggs also that may be present.

The other hosts which have been noted from time to time such as fireweed, cudweed, lettuce, etc., seem to be rather incidental hosts which are found to be infested only when growing in a heavily infested grove where the growth has commenced to harden up. They are probably not much of a factor in carrying the aphids through the winter and can be neglected by the growers; although we have gathered evidence during the past winter that in some cases they did, especially the cudweed, carry the aphid over. The cherry laurel, is a host plant, but like citrus, the aphids will attack this only when it has tender foliage. Sometimes however, the cherry laurel comes out in the spring a little in advance of citrus.

The aphid is spreading but slowly into the satsuma belt. Because of the long dormant season of satsumas it does not seem likely that the aphid will ever be much of a pest on these trees. However, the practice of satsuma growers of planting one or two round orange trees in their groves should be discouraged. We have seen many cases in the last year where the aphids have spread from these round orange trees to the satsumas. What little fruit the growers may get from the round oranges is not worth while when the danger to the satsumas is considered.

Further tests with the finely ground tobacco dusts which Mr. Miller reported on last year indicates that we have here one of the most promising dusts for aphids as they are very much cheaper than the nicotine-sulphate-lime dusts. They must, however be put on the trees when the latter are wet with rain or dew. Otherwise they do not stick well enough to give an efficient kill.

The traveling hood reported upon at the meeting last year has been improved upon. We are making one much less heavy and cumbersome and we invite any of you who may be passing through Lake Alfred to stop at the sub-station and see it. This hood will enable the growers to dust on any reasonably bright day, even though there may be a fairly strong wind blowing. In other words one can dust during the majority of days with the hood whereas there is only an occasional day or part of a day when dusting in the open is practical.

Member: Has Derrisol been used as a dust?

Prof. Watson: No, it is not used.

Richard Compton: What are the ideal conditions that are beneficial to the growth of the aphids?

Prof. Watson: A certain degree of temperature. The temperature we have in April and May, 82 degrees during the day, 70 degrees at night. If it gets too hot, as in the summertime, the breeding is slowed up.

Mr. Compton: If a man had his grove fixed so he could spray it, would that keep the aphids down?

Prof. Watson: Yes. A spray of nicotine sulphate or oil-emulsion is very effective.

Mr. Compton: Have you any data on the reason why the aphid doesn't attack the grapefruit trees to any considerable extent?

Prof. Watson: I don't know I am sure.

Max Waldron: I venture to say our grapefruit at Babson Park was as badly infested as the oranges.

Prof. Watson: Yes, we have seen them attack grapefruit, but they are not severely attacked as a usual thing.

Early Fruit Maturity

Robert Prine, Palmetto, Fla.

In a discussion of this kind it is well to bear in mind that we are dealing with nature and it seems that nature has more tricks up her sleeve than we can guess.

In a discussion of the facts that influence early maturity of citrus fruit, it may be well just here to ask just what is mature citrus fruit. Theoretically fruit is mature when the seeds have matured and the fruit is practically rotten and the seeds scattered so that the plant may reproduce itself. This as you know is not the state desired in citrus fruit, so the question arises what shall we accept as a standard for maturity of citrus fruit? We will have to accept a commercial standard of maturity; that when the fruit has reached its normal size and is pleasing to the palate it is commercially mature.

Taking this as a basis then when fruit has reached its full size and is edible without much artificial sweeting it is mature.

I am going to take it for granted that nearly everyone when thinking of this subject of early fruit maturity has in mind the maturity of early grapefruit.

After some years of observation of myself and others, I have come to the conclusion that there are a number of factors that effect the early maturity of fruit.

I will say the first is habit. I have observed that on groves where for a number of years the fruit has been removed early in the season nature seems to want to mature the fruit earlier.

But there are other factors closely aligned with this that I will mention later.

Second, I would say that soil types play a most important part in fruit maturity. It has long been an established fact that hammock soils ripen fruit earlier.

Third, let us not forget that the old question of root stocks presents itself again, for it seems root stocks do play a very important part in the early maturity of fruit, especially grapefruit. We have in mind only the earlier varieties of fruit. Root stocks play an important part in the maturity of grapefruit especially regarding the solids in the juice. Sour orange, grapefruit and sweet stock will produce an earlier matured fruit with a much higher Brix reading than fruit grown on rough lemon stock. Conversely fruit grown on rough lemon root stock does not have as much acid

as fruit grown on other root stocks mentioned, though in other respects the fruit is much the same.

Fourth, climate and general grove care are of vital importance. As most of the early grapefruit of the state is shipped from territory adjacent to the coast and on very low lands and as one of these territories happens to be Manatee County it may be opportune just here to state the reasons that fruit is and has been for many years matured earlier here than in many other sections of the state. As this section is primarily a grapefruit producing territory special mention will be made of grapefruit.

Most of the soil on which grapefruit matures early, of which I have had an opportunity to observe is low, very low, some locations being only three feet above sea level. It is hammock soil mixed with oyster or other lime shells. It is close to the sea coast and it has an abundance of moisture.

As most of the earliest of early grapefruit is shipped from Terra Ceia Island let us note conditions there as to soils and grove culture. The soil on this island is hammock with a mixture of lime shell, the average of the surface of the soil above sea level being from three to ten feet. Trees are set quite close together about one hundred and sometimes more to the acre. Also quite a number of the groves are sub-irrigated. In groves not sub-irrigated provision is made for irrigating the trees by running water on the surface. As it is an easy matter to have flowing wells, there is artesian water in abundance. I am also told that most of the groves are from bud wood selected from trees that have proven early in maturing.

Taking for granted that the fruit crop has been moved early in the fall, say by the first to the tenth of November, the grove is immediately fertilized, well fertilized, the fertilizer well worked in, the grove well sprayed with a clean-up spray, and well pruned. If there is not enough moisture the grove is irrigated sufficiently that the trees may begin immediately to regain the vitality expended in maturing the past season's crop. It may be well to say that this island has enjoyed ample protection from the cold weather so as to make possible constant cultivation during the winter months. The natural result is that being supplied with liberal food and water the tree begins early in the spring to bloom. Early blooming aids materially in the early maturity of fruit.

During the entire season the trees are not allowed to suffer for want of fertilizer or moisture. I had quite a good showing of bloom this year in January and February, though most of the bloom was later.

Some growers fertilize two times, and others three times during the year. However the last application of fertilizer is usually applied not later than the first of May and the cultivation stopped. This gives the tree five months in which to mature the fruit after the last application of fertilizer.

I believe that with the proper soil and climatic conditions, different fer-

tilizers have different effects on fruit though authorities seem to differ as to these effects. Growers have found it expensive to experiment.

It may be well to mention that grapefruit that is somewhat flat in shape seems to mature earlier than others. Also that fruit grown on rough lemon root stock or fruit that is low in solids will not hang on the tree long after maturing.

This has been a source of much trouble to growers on Terra Ceia Island and adjoining lands for the past two seasons. The Florida State Maturity law has set a standard of maturity for grapefruit with a minimum solids of 8.50. Numerous tests made by various persons will bear out the statement that there is a majority of the growers that are delayed in shipping their fruit until after the time limit of the law on account of low solids, necessitating the moving of fruit on a glutted market, owing to the fact that the fruit could not be held.

Is it a fact that grapefruit is not mature until it has total solids of 8.50?

I ate grapefruit this forenoon that did not have solids of 8.50 and never have had, yet no one would say that fruit was not fit for consumption. I can also truthfully say that the fruit has not materially changed in taste since last October. I contend that grapefruit that has the size and juice content and will show a ratio of seven to one is mature. Our tests have shown that high or low solids are determined by the kind of rootstock and the character of soil.

Supply and Demand in the Markets of Citrus Fruits

Frank Kay Anderson, Orlando, Fla.

Three notable contributions recently have been made to the literature concerning the marketing of Florida's citrus fruits. Each of these is worth reading and careful study by those who wish to understand the complexities, and the problems which confront those in charge of the operations which result in turning our citrus crop into spendable money.

Reference is made to a somewhat bulky report of the Agricultural conference not long since held in Miami under the auspices of the Florida State Chamber of Commerce, to an article entitled Isolating the Germs of Citrus Marketing by Jefferson Thomas, appearing in the March issue of The Florida Grower, and lastly to an article entitled, The Elimination of Waste in the Citrus Industry, by Professor E. L. Lord, University of Florida, which appeared in the March issue of The Citrus Industry.

Any grower who has read all three of these articles may be prepared to accept the fact that there are many complex problems involved in the satisfactory marketing of our citrus crop, and that no one schedule of action can hope to solve all of them.

At Miami, appearing before a so-called Agricultural Committee of the Florida State Chamber of Commerce which contained not one person active in, or actually versed in, agricultural or horticultural production or marketing, Mr. J. C. Chase, Mr. Frank L. Skelly, General A. H. Blanding and Mr. L. B. Skinner, respectively gave that committee and those present a very great deal to think about. The growers of Florida owe these gentlemen a debt for their action in opening the eyes of that organization to an actual state of affairs, and thus diverting a pragmatic interest on the part of certain persons away from citrus and perhaps into other channels where they are perhaps better versed and are better calculated to be helpful.

That report is a voluminous one, but here and there in it the pungent facts injected by the gentlemen to whom credit has been given stand out in substantial relief against a mass of theory and conjecture advanced by others with no practical experience to give weight to their views.

The article by Jefferson Thomas is of considerable interest to those who have had contact with Florida's mar-

keting problems over a period of some years. It is really directed to those whom we might call advanced students though some who may have had actual marketing experience in connection with products of other sorts may be able to grasp many points of interest. There is lots of meat in it, even though all of us cannot agree with all its conclusions.

The article by Professor Lord is more easily understood even by those with short acquaintance with Florida marketing problems. It is also notable in that it deals frankly, even though in diplomatic language, with some problems and complexities which to our knowledge no other writer on this subject previously has had the courage to meet face-to-face. It is a masterful exposition of certain of these complex phases, though naturally enough all of us may not agree on every item of it.

These three contributions in a way dovetail into each other. They overlap only in places, and only slightly. The three should be read together in order to obtain a grasp of some of the many problems which are involved in this important phase of our citrus operations.

As a matter of fact, volumes could well be written on this subject of citrus marketing by any of several persons posted in the various phases of it, and they could then be studied carefully by those with investments in Florida citrus growing enterprise, perhaps with considerable profit.

Those who are assembled here, and those who later may care to read this paper, at this point doubtless feel entitled to learn a lot of figures concerning citrus production. You possibly expect now to listen to an assembly of figures covering the present and possible future production of citrus fruits in Florida, California, the Isle of Pines, Porto Rico and other citrus producing areas. Time could be taken up with those figures, but in my humble opinion all the figures which might thus be introduced, however voluminous and however accurate, could at the best have only small bearing upon some of the problems confronting Florida, problems which come well under the workings of the law of supply and demand.

There are some who view with alarm the possibility that thirty-five millions of boxes may represent the total of the Florida citrus crop a few years hence. To our own mind thirty-five million boxes under certain conditions need not be any more serious a problem than that which confronted those early growers who met in Orlando in 1888, at the first recorded meeting of the sort, to consider what should be done with a possible crop of two millions of boxes the following season.

All things are relative. The older we grow, the better do we realize that fact; and the older we grow in experience in marketing citrus crops the better we realize it in that particular connection.

Thirty-five millions of boxes, if ever they come, may present an unsolvable problem, but at any rate we are not up to it yet. Such figures as are available concerning plantings do not at any time contemplate the mortality which we know exists among young citrus trees, some of which are unduly exposed to extreme hazards such as we have encountered during this last year, and some of which are not calculated ever to produce truly marketable citrus fruits.

Thirty-five millions of boxes as a Florida citrus crop may never arrive. If it does, its problems will depend then upon a multitude of variable factors here in Florida; and an equal number outside of Florida. What will the California crop be at the same time? What will be the crop in Porto Rico; in the Isle of Pines; in the Rio Grande Valley? Who knows. Yet those figures will have a most substantial bearing upon our own equations which we then must work out. What will be the crop of apples that year? What about prunes? All those questions and a lot of others must be answered before even the best posted person having to do with Florida citrus marketing can make any estimate of possibilities which will be worth the paper it is written on.

Given definite answers to all the foregoing questions, it still would be necessary to know a lot of other things, among them what would be the business conditions and relative prosperity of those sections of the country where we are accustomed to sell our fruit before any guess would be really worth while. Even then a qualified person, if asked for his guess would want to know what about Florida sizes that season, and how much fancy fruit, and how much which would pass as U. S. No. 1, were to be figured upon.

Then comes perhaps the greatest question of all. Are we to market a possible thirty-five million box crop at any time in the future upon the present basis and structure of freight rates, or shall this problem be faced under more sympathetic transportation conditions, which shall allow us opportunity to distribute our products more equally over a larger portion of the United States than we have been accustomed to reach profitably. Shall we then be able to lay our oranges down in Denver in competition with California oranges; remembering that Denver is eighteen miles nearer to Arcadia than St. Louis is to Los Angeles. Why not? In all fairness, equity and justice are we not entitled to a basis of transportation charges which shall allow us as broad a field for competition as is given to any other citrus producing area in the United States?

As a matter of fact, is it not as greatly to the interest of the transportation factors serving Florida to see to it that we are given a proper chance to compete, as it is to the interest of the grower? Personally I believe it is, even though up to date we have made but small progress in selling that idea to those in charge of the des-

tinies of the carriers serving this territory.

Today we face the problem of disposing of fifteen to twenty millions of boxes of Florida citrus fruits much better prepared and with much greater chance of profitable success than did those growers who met in Orlando in 1888 to wrestle with the problem of two millions of boxes. The future in all probability shall develop ways and means as yet undiscovered to us. At any rate there is small need to cross a bridge which in point of fact may never exist.

In the operations of any natural law there is to be found some fundamental point which brings that law most sharply into operation. In looking into the law of supply and demand as affecting our citrus fruits we find that point exists in the fact that the average human is possessed of but a single digestive tract. They say there are exceptions to all rules, but it is sufficient that average humans possess but one stomach each.

If the demand of that stomach has been well supplied with apples or prunes, which are direct breakfast table competitors of our citrus fruits, then there is small demand for our oranges or grapefruit. Therefore the available supply of these other fruits, plus the matter of their quality at that time is always of the greatest significance to us. Bear in mind that these are not the only things with which our citrus fruits must compete for public attention. There are numerous other fruits and other articles of diet which also compete for attention with our own products; but apples and prunes under the habits of eating which today prevail in the United States furnish the most formidable and direct competition. The visible supply of these vitally affects the demand for citrus fruits.

Let citrus market prices climb just a little too high, let the eating quality of citrus fruits be a bit unsatisfactory and upon thousands and thousands of tables apples and prunes come to the fore and citrus fruits disappear into the background. And in many thousands of lunch boxes apples appear in lieu of oranges. The adjustment thus brought about is quickly reflected in the market prices for citrus fruits.

Given a season when the balance of supply and demand as affecting apples prunes and citrus fruits is satisfactory from the standpoint of the citrus producers, then we have to figure total citrus production from all producing areas, and the relative quality of the offerings from each area at that time. In that connection it is well to remember that of the total of citrus to be sold in the markets up to now Florida is supplying only about one box out of each four boxes sold. Remembering that, we also shall remember that for Florida to bring about through special merchandising or advertising effort, any great change in the eating habits and preferences of the consuming markets, such as shall materially change the prevailing demand, it will be necessary so to speak for the tail to wag the dog.

"Florida produces the finest oranges in the world." That is a quotation. It is something you may frequently hear anywhere in Florida almost any time. It is one of those half-truths which is most dangerous. The whole truth is that Florida produces a limited amount of fancy grade oranges, which are literally without a peer among the oranges produced elsewhere. That this is true is evidenced by the fact that even during the unsatisfactory market period in January 1927, Florida oranges of this character were selling in the New York market at and above eight dollars per box, wholesale. This was about a dollar per box above the prices then being realized for the finest offerings from the Pacific coast.

However Florida's production of such oranges is limited. On the same days when the finest Florida oranges are running well above California's finest we find it almost invariably true that the average prices realized for all Florida oranges offered is either slightly or considerably below the average for all California's offerings. That can only be due to a preponderance of off-grade, undesirable fruit from Florida which can thus bring the average prices down. The word "undesirable" in that connection is used advisedly. It is relatively undesirable from the standpoint of the buyers, and from the standpoint of the consuming public whose tastes and favoritisms, the wholesale buyers accurately reflect, or else the bidding for it would be more active. Whatever may be the opinion of those who painstakingly produced it, their opinion is valueless. In connection with the merchandising and sale of oranges, as in connection with the sale of any fruit or any other article it is only the opinion of the ultimate user which can count for long.

Apple growers may be all out of sympathy with your tastes in the selection of apples for your own consumption; but it is the sum total of your tastes, and those of all the others who must be depended upon to buy the apple crop, which settle the question of which apples are the most profitable to produce.

Looking all the facts squarely in the face, based upon the preferences of the consuming public of the United States, as definitely exhibited in sales records covering several years and a total of millions of boxes of citrus fruits, we find that California has the best of us in the sale of oranges, while we have a corresponding, if not far greater, advantage over California as far as grapefruit is concerned. Our competition on grapefruit, that is the competition which makes our selling forces get out and hustle, comes from the Isle of Pines and Porto Rico up to now. What the Rio Grande Valley of Texas may mean to us at some future date is as yet problematical.

Are these differences due to any superiority of selling machinery handling the products of these different areas, or are they due to inherent advantages in the products themselves? That is a question which should be faced fairly and squarely.

My answer to that question, based upon my own experience and observation, and as careful a study of the question as I am capable of making, in which study I have been fortunate in having access to a large amount of reliable information from Florida, California and Porto Rico, and from a great many markets, is that it is due almost wholly to noticeable differences in the fruit itself as it comes upon the consuming markets, though there are some modifying factors which sometimes complicate things. Chief of these is the large amount of mid-season round oranges which conditions require that Florida shall market within what is relatively a very brief period, a period all too short for the requirements of the situation.

Careful examination into the selling machinery employed by the different producing areas fails to develop the presence of any super-men in charge of any of the selling operations of what we might style our competition. On the other hand, if it is fair to judge by the standing of men at conventions of the fruit trade, and in the operations of the American Fruit & Vegetable Shippers Association, and in other places which bring them together, we find that the men at the head of our Florida citrus selling operations apparently stand at the very top in the regard of the fruit trade generally. Careful search also fails to reveal any particular merchandising plan put into execution by sellers representing any other producing area which possesses any substantial points of superiority to the plans and policies followed by the leaders in Florida citrus selling. That is, we fail to find any plan of selling which apparently reveals any superiority of intellect or experience, though we do find a natural tendency to take the fullest advantage of the fact that citrus fruits from some other sections are not so highly perishable, do not deteriorate so quickly after being taken from the trees, as do our fruits. Also advantage naturally is taken of the far more liberal transportation arrangements and freight rates which are elsewhere enjoyed.

Plenty there are who will argue that California possesses manifest advantages in its selling machinery over Florida. I, for one, must disagree with that view. Such persons generally base all their arguments on oranges, and overlook grapefruit and lemons. My own idea is that if the California method was so infinitely superior as far as oranges are concerned, it should manifest at least some of that superiority in connection with grapefruit; and it should manifest that superiority if such superiority actually existed, in connection with lemons. Yet today Florida grapefruit reigns supreme and as far as California is concerned, unchallenged. Also California today has a far greater problem on its hands with respect to the profitable distribution of its lemon crop than Florida ever has faced in connection with oranges. To date California's lemon selling problem is most serious, and there is apparently no solution of it in sight, notwithstanding the fact that ninety per cent of

more of their lemon sales are in the hands of one organization which is widely heralded as being the largest citrus selling organization in the world and which is supposed to represent the acme of selling efficiency. At least it is the one most frequently held up as an example by those who would argue that Florida's weakness is chiefly developed in its selling.

The law of supply and demand is inexorable. It governs effectively, and very definitely, all our commercial activities. It has not yet been surmounted successfully by any man or body of men in the history of commerce.

It is true that it has at times apparently been evaded by groups or combinations in a given industry, but when all was done, and the obscuring smoke screen had drifted away, it was found that the result of the most careful preparation and scheming had been only to postpone for a time the working of the law of supply and demand, and that in the end the results were the same.

Supply must be calculated to meet demand, in all transactions where profit is sought. Failure to coincide supply with demand can only mean a loss to the producers.

Non-perishable products, which can be stored successfuly for considerable periods, sooner or later have to yield to demand. Perishable products necessarily yield to it more quickly, in fact at a rate which is directly proportioned to their perishable nature. Citrus fruits are perishable, and therefore prices quickly respond to existing demand; but at that not so quickly as they do in the case of peaches or tomatoes which are even more perishable by nature.

The theory that control of volume of sales in any field of commerce carries with it a corresponding control of prices cannot be supported by facts from any authentic source. The law of supply and demand is always on the job, whether it be in the field of steel, iron, cement, lumber, flour, canned goods, fruits or what not.

Large combinations in the field of manufacturing in the United States have proven to be beneficial, but analysis of the benefits derived therefrom tends to show they have come most largely from the elimination of wasteful practices in the particular industry and substantial reduction generally in the costs of manufacture.

No one man, and no organization ever has shown so keen a knowledge and so ready an appreciation for the workings of the law of supply and demand as has Henry Ford and the organization he heads. Time and again in years past, with no worth while competition in their particular field, price cut has followed price cut, to the amazement of the public in general. To most people these reductions in price at the time appeared uncalled for and foolish but that organization knew and proceeded to demonstrate, that each such reduction materially broadened the demand for their product. The remunerative nature of their reward for carefully observing and tak-

ing full advantage of this natural law is sufficiently well known not to require comment.

In view of the ascertainable facts in many other lines of selling, and in view of the ascertainable facts from the whole field of citrus selling, it does not seem logical to conclude that we in Florida can profit to any extent by putting all our citrus eggs into one selling basket.

On the contrary, we are selling a perishable product which belongs actually in the luxury class, for our consumers can if necessity requires, get along very well without our oranges or grapefruit; and we need to keep up the strongest possible selling pressure. How many automobiles and how many vacuum cleaners would be in use today if all the automobiles or all the different vacuum cleaners had been sold by one concern? That is something to think about.

What then can we in Florida do to increase profits in citrus production in logical accord with the workings of supply and demand?

Here are some things we can do:

1. We can learn how to keep our production costs at a minimum consistent with the production of good fruit.

2. We can begin at the very bottom of production with the aim of giving consumers as nearly as possible what they have demonstrated they want.

3. We can with profit study the lines of action followed by those whom we know have achieved substantial success right here in the Florida citrus field.

4. We can earnestly strive to the end that we may spread out our harvest over the longest possible time by natural though not by artificial, means.

5. We can quit kidding ourselves by averring that, "Florida produces the world's finest citrus fruits."

6. We can awake to the fact that we have here in Florida a good many acres of what are in point of fact, "beginners' groves," which are not calculated to compete with groves either here or elsewhere which are commercially fit, and commercially profitable; and further we can awake to the fact that necessarily we must eliminate these "beginners' groves" from our calculations, or at least eliminate them until their owners come to a realization of facts and begin an endeavor to work them over into commercial groves.

7. We can divorce real estate selling and commercial fruit growing.

8. We can frown down those who for their own purposes would keep our citrus business constantly before the public in this or that newspaper to the need that they may prove their contentions, either that it is the most profitable business on earth or the most unprofitable, according to the view they advocate.

9. We can quit allowing ourselves to be kidded by persons outside the industry who have axes of their own to sharpen on our grindstone.

10. We can quit kidding ourselves that some legislative or other miracle some day will change everything and put us on the easy road to the end of the rainbow.

11. We can study citrus history more and embrace citrus hysteria less,

12. We can work to minimize the effects of citrus policies in our marketing operations and to substitute healthy rivalry for destructive competition.

13. We can educate ourselves out of the belief that ours is the only citrus producing area which has any troubles or difficulties. Only a trip into one or more of these other areas is necessary to do this, if a reading of their citrus literature does not.

14. We can very profitably learn to back up the efforts of those scientific men who would teach us to do better if given opportunity, and to see that in the future none of these are allowed to be crucified by any whom plain words may offend.

15. We can congratulate ourselves that more and more as time passes we are learning to submerge our personal feelings and to work together for the common good. First the Florida State Horticultural Society, later the Growers and Shippers League of Florida and the Fruitsman's Club are milestones on our path of progress toward a greater unity of purpose and endeavor.

16. We can remember that here in Florida is the only natural home of the orange within the United States and that we are justified in the fullest faith that come what may a substantial citrus industry always shall survive in Florida.

All these things we can do, and other things just as important, and all will aid in trying to make the citrus industry of Florida properly and profitably responsive to the workings of the law of supply and demand.

Or else what?

Why we can do as an old fellow down near Bradley Junction when Hon. H. J. Drane was first elected to congress. He wrote: "I voted for you, and I am glad you got yourself elected. You look to me like a good man."

"Now here is a chance to make a name for yourself, and I want you to do it right way. You just get up a bill and have it passed, abolishing that law of supply and demand, it has been playing hell with the farming business for fifty years, and something should be did about it."

Florida Marketing Problems

Victor Newton, President Fruitman's Club, Orlando, Fla.

I am going to talk to you as I would if you were seated in my office or if I were in your office. I am not going to tell you how to cure all citrus evils because frankly I don't know, and when one tries to give advice, based upon assumption, or without sufficient knowledge of the particular subject, it is nothing more than running a bluff.

Every now and then comes from all corners, particularly after a bad marketing year, the inquiry, "What is the matter with the citrus industry of Florida?" "Why don't we adopt California's methods, why don't we employ a national character to play the part of a Moses?" Friends, Florida can't use California methods. Some seem to think that because we are nearer the markets than California we have the advantage. We have a great disadvantage in most instances, for in California a sales manager has from six to ten days to determine where a particular car will go, while in Florida if a sales manager doesn't know within forty-eight to seventy-two hours after he receives a manifest where that car of fruit is going, it becomes a distressed car. A few distressed cars piled up in an organization causes that organization to be a distressed organization, and will affect the entire industry, and sooner or later they must dump those cars. Also, California has a freight structure superior to ours. I will touch on this later.

As to a national character to act as a dictator, I cannot at this moment think of any individual outside the boundaries of our state, who could handle the citrus industry of Florida, better or even as well as some of the leading citrus men in this state.

You then ask, "What is the matter with the citrus industry?" I say, "you, the grower." You are the cause of the citrus industry of Florida being in the condition it is today. It is due to the fact that you do not use the proper economy and efficiency. If the manufacturers of America used the same system as the grower, 80% would be in bankruptcy in eighteen months time. It behooves the growers of Florida to get away from the idea that an orange grove can take care of itself. You should install accurate accounting systems, be able to determine what your expenses are, what your production cost is, compare it with your neighbor, and adopt your neighbor's ideas if they are better.

What I mean by economy and efficiency is to produce better fruit at lower cost. With the increase in production in Florida and California and with the sales resistance climbing every day on secon

grade fruit, it is going to be suicide for a grower to produce inferior fruit in the future. I believe, in time, reputable marketing organizations will refuse to handle your fruit if it is not of good quality. What we must do is to raise better fruit and try to develop some by-product organizations for our off-grade fruit.

After you have raised good fruit, be careful in selecting your marketing organization; be certain it is managed by capable men; be certain they use tactics in keeping with the demands of the day. Above all, demand that that organization work with the other reputable marketing organizations, because in Florida we can never hope to control the situation except from the supply and demand standpoint, and that can only be done by the marketing organizations working together and determining what the markets can take within one week, and each agree to ship their portion, and not only agree, but live up to their agreement.

I was talking to a grower the other day who stated that he had marketed through one organization in Florida, quite a reputable concern, for a number of years, and said he had never gotten a satisfactory return until this year. Last year he inquired why other people received more for their fruit than he did. This organization told him it was because his fruit was of such inferior grade that they couldn't do any more for him. He determined to grow good fruit. He had good fruit this year and found, under the adverse conditions, that he received more money for his fruit than in years gone by. The grower I referred to was very much surprised when he received his check for his oranges, and he called up the marketing agency and asked if they hadn't made a mistake.

In signing up with a marketing organization, don't just listen to what some of their road men may have to say. A lot of agents make promises that the organization themselves disapprove of. Use reason. In the first place, you ought not to expect a marketing organization to do anything more than to handle your fruit efficiently. If you expect them to finance you and take care of your every need, you are putting on them a burden that they cannot stand up under.

The shippers of this state also have a part to play. They should practise economy and efficiency as well as the growers. If your shipping agency isn't practicing efficiency and economy you had better cut loose from them. We shippers of the state must reduce the cost of getting the fruit from the tree to the market. In our method of packing, we should begin to think about something to reduce our cost of packing. We can't afford to be paying 27c for crates and 9c to 11c for paper that is thrown away as soon as the container hits the market. We must reduce freight rates and the only way I see to do this is by concerted effort. We must work through and with the Growers & Shippers League. That organization deserves your support, it is working for your interest. Mr. Curtis Robinson, Secretary and Manager of the League, cannot do it all, he needs your help. At present a good portion of his time is spent raising money to carry on

expenses, while he should be spending his time and efforts otherwise. We should have a flexible freight structure, a kind of zone rate. We ought to be able to put fruit into Cincinnati, Cleveland, or Chicago at the same rate. As it is now, we go into Cleveland, and if a buyer wants 25c allowance, we give it to him. It is good salesmanship to do that rather than divert to Chicago or Cincinnati and pay additional freight and perhaps get no more for the fruit, but if we had a zone rate that would enable us to divert that same car to Cincinnati or Chicago without paying additional freight, it would greatly strengthen our sales manager's position and I believe if such an arrangement were in effect it would eliminate quite a few requests for allowance.

In conclusion, I wish to say that I believe the citrus industry, as well as the State of Florida as a whole is far from being on the rocks, but both need your loyal support. Let each of us put our shoulder to the wheel and do our part and in the very near future we will be handsomely rewarded.

A Brief History of Agricultural Cooperation and its Significance to Florida

C. C. Commander, General Manager Florida Citrus Exchange, Tampa, Fla.

It was only last year that America in Philadelphia celebrated the Sesqui-Centennial, the 150th anniversary of a co-operative movement in government which has held the eyes of the world ever since. That Sesqui-Centennial might well have celebrated the 150th anniversary of two unparalleled opportunities in agriculture. When the American Colonies entertained at their Boston Tea Party and subsequently severed dependent connections with Great Britain, there was opened to the virile, home-loving and home-seeking pioneers the most productive farm land in the world. It was available in practically any amounts for the mere asking. Unrestrained by age-old fetters of cast, unhandicapped by exactions of land lords, expensive governments, or worn-out soil, the American farmer at that time had at his hands the unlimited possibilities that rich, productive, virgin land could produce and that independence of action and thought could develop.

Such was the first agricultural opportunity which a Sesqui-Centennial might have celebrated.

In direct contrast to this first lies the second. Concurrently with the American Revolution on this side of the Atlantic, great changes in the status of the people of Denmark took place. This people, because of the lack of mineral resources or proximity to manufacturing necessities, has always been dependent upon agriculture. The Danish farmer in one stroke which is as significant and as epoch-making to him as the American Revolution is to us—in one stroke was removed from the basis of a slave or chattel on the farm-estate; from a position of being worked with the farm and sold with it like one of the cattle, to the status of a free, independent individual.

Freedom alone he had. He had no money and no customs to guide his steps. He had no property as the death of the feudal system left all available acreage tied up in huge, family-owned estates. All that his freedom gave him was the opportunity to work for himself and his family by the best means at his hands, in the poorest, most over-worked and worn-out soil in the world. And much of this land was far beyond the reach of his buying power even though the prices of those days were considered.

Such was the second great opportunity. What would a sesqui-centennial of these two agricultural epochs show today?

Across the Atlantic we see the Dane, the greatest land-owning farmer, the wealthiest farmer, the finest home owner with the best churches, schools and advantages of social life. Credit of the Danish agriculturist is so high that banks bid for it. His products are so in demand that the world seeks them and whenever they appear in the world markets a premium is paid for them.

In America, on the other hand, the farmer is the greatest wealth loser, the greatest land loser. His rural schools are a problem of today. His whole rural scheme of living is the problem of the nation; a standard of living which was until recently so low that thousands have deserted the farm for the status of a wage earner in the city. The economic situation has been such that the American farmer has traded his independence of social life and his agricultural opportunities for the city tenement and flat where even the air is stifling.

Such undesirable comparisons would a sesqui-centennial of these two wonderful agricultural opportunities disclose. Why should there be this difference? Why is there this tremendous contrast in stability and position? The American had every advantage. The Dane had practically none. Yet only one difference has marked the efforts of the two in the 150 years that have passed. That difference may well be summed up by the word, "co-operation."

Denmark was and is the land of the co-operative. It is the country of collective marketing, business farming. America continues in the general ways of its ancestors. It laid a premium upon individual and independent farming, each man for himself. Only in the present day, after 150 years of struggle, has America turned definitely to co-operation and for the first time, authorities are voicing the hope that the solution to the agricultural problem is close at hand. No less an authority than President Coolidge says of co-operation that it is "the hope of American agriculture."

Such characteristics and dates essentially mark the beginnings of modern co-operative effort. From a careful study of the history of the co-operative movement from that time forward, from an understanding of the reasons for the failures made, and from a realization of the fundamental causes of progress an unescapable fact forces itself forward. The co-operative principal is not a new, untried or radical idea. It is one which has been tested in the fires of economic stress, one which has been proved commercially sound and one which is today making tremendous strides in improvement of the agricultural status of the American grower today.

History also forces upon us a curious analogy. It was the American farmer who first saw the possibilities in the Swiss cheese and butter rings and brought the plan to America in an attempt to adapt it to his own advantage. The Swiss plan was simple. One farmer would make the cheese and butter for himself and whatever number of his neighbors desired such service. This is our first record of modern agricultural co-operation.

The modified American form of the Swiss idea was taken by the Danes, adopted and perfected. He went into the co-operative idea earnestly and thoroughly. His progress was at the beginning not phenomenal. No co-operative effort in history which has been really successful has speeded to success. Perhaps it was because the Dane rose from a condition of dependence and depression that he was more easily turned toward co-operative effort by submergence of his individual marketing identity into the group. Whatever the influence was, he grasped the educational efforts made possible by co-operation and forged steadily forward.

The Danish modification followed the one commodity type. The farmers were advised and drawn together into a plan. The development of that plan from the small group to the community, thence to the nation-wide organization and then beyond to the final world markets was accomplished principally by education. Denmark is truly a national co-operative. It is not, however, governmentally so. The co-operatives govern themselves, run their own business, build up and handle their own credit. At no time in their history has the government contributed a penny toward their support or regulation. At no time did the Danish government even consider such legislative fallacies as the McNary-Haugen Bill which was recently, and fortunately, killed in the American Congress. The Danish government adopts rules and regulatory measures to assist and protect but the fundamental governmental function is one of investigation, research and education.

A co-operative in Denmark controls practically all of that produce in which it specializes, grown in the nation. A Danish farmer usually diversifies and therefore belongs to several co-operatives. The co-operative follows through the product from the farm to the consumer. It assembles, grades, standardizes, packs and sells. It utilizes all the commercial tools at its disposal. It studies its markets, it seeks new markets, it varies or modifies its product according to the preference of individual markets. It has done its work so well that its products command high premiums.

Denmark has carried co-operation to its highest efficiency. It has extended it into what many economic leaders believe to be its ultimate achievement—social welfare. The Danish co-operative sees to it that fair rates are given and merchandising of its products are carried through to the most advantageous stage for both the farmer and consumer. It even goes so far as to own and operate steamships—the co-operative group owns more than one hundred. Denmark has co-operative insurance companies, saw mills, flour mills, factories and so on down the entire commercial line. It co-operates in school management, in church life, in libraries, in musical entertainment and other forms of social life.

Business, industry and banking have never been better situated than with the culmination of the co-operative effort in Denmark. Their contact with agriculture is harmonious and friendly. It is

to that healthy status of the Danish grower which the banks and business of the country give credit for their prosperity.

The complete reference in this discussion to the success of Danish co-operatives is by no means an inference that American problems can be solved by following the same detailed action which brought success and happiness to the Danish farmers. Quite on the other hand, the details probably would not be at all applicable in America. The principle, however, is that which is significant and applicable and it is only in Denmark that the co-operative principle finds such complete, varied and successful application.

Any examination into the progress of the co-operative movement in America brings to light what many of its opponents advance as evidence of its impracticability. There have been many failures of the earlier movements. It has been remarked that most of the co-operative movements of the American people are now in the cemeteries. As Henry C. Taylor, former Chief of the Bureau of Agricultural Economics of the United States Department of Agriculture so aptly phrases it, "it is also true that most great men are found in the cemeteries, but this does not mean that these men have not served an important purpose and their influence is still felt throughout the nation."

In examining into the high spots of American co-operatives, records show that as early as 1785 societies were formed in Philadelphia and Charleston to provide educational effort in an attempt to improve agricultural conditions. Since the movement was entirely along an edu cational line, spread and growth was slow Nevertheless, in 1840 there were many such societies on record and by 1868 nearly fifteen hundred.

In those days the complaint of the grower was the same as it is now. In fact, the comment of that time could be written today and we would not recognize the difference. Then as now, was heard the objection that the producer and the consumer should have more to say in fixing the prices. Then as now, was heard the objection to the intermediate agency handling the product.

The first real co-operatives in this country began around the shipping point They were local and individual in character. They merely substituted a small group of farmers for the individual Each group worked independently and from a marketing standpoint were intensely competitive with others from the same general territory handling the same product. This form still exists today except that where a few decades ago there were thousands of such group co-operatives today there are dozens. From them or through them, one linking with the other until a great chain or federation has been formed, has arisen the present true co-operative. The earliest of these on record is the co-operative dairy at Goshen, Connecticut. In 1810 several farmers brought together their milk for distribution. That is all that was done and this failed. The next recorded effort was in Wisconsin in 1841, which was an American adaptation of the aforementioned Swiss type of butter and chees

rings. This form of co-operation spread throughout the entire dairy country. One started in New York in 1856 was very successful. Another organized in that state in 1863 is still in operation.

These early attempts might be called the creeping stage of American co-operation. They have been clearly demonstrated as failures in general, but they were admirable failures in that they produced experience of value to guide further effort. They taught the value of quantity handling of farm products which gave to the producer some of the profit accruing through preparation for the market. In them started the improvements in quality and in standardization. They gave the producer better returns for quality and some returns for the lesser grades which often represented a complete loss to him before. It brought better prices but did not prevent dumping and made little improvement in finding markets and no improvement in developing markets or in aiding the farmer to anticipate or develop a production schedule.

Another significant phase of early co-operative movement is found in the group buying activities. These reached their culmination in the Granger movement in the Middle-West during the last quarter of the 19th century. There were two phases of this movement which were significant and which today are important to American agriculture. The farmers in those days were hard pressed because of the low price of products they had to sell and the high prices which they had to pay in the scattered, inefficient and isolated country stores. The Granger stores and the Granger influence in the development of mail order houses awakened the most remote country store to a realization of the necessity for service and fair prices. The Granger movement has passed but the influence of the mail order house has continued without further effort on the part of organized agriculture.

Also growing out of this movement was the establishment of what has developed into the Inter-State Commerce Commission and a complete system of railway rate control, which is significant to the better and economical distribution of agricultural products.

Following these early beginnings, the co-operative movement in America was almost at a standstill with one great exception. That exception following the late seventies brought into being the true co-operative of the type which is now gaining in force. It is the type to which government leaders, agricultural authorities and business men as well are turning their attention and assistance.

That exception is the California Fruit Growers Exchange. It is an adaptation of the Danish improved Swiss-American type. Improvements have been along characteristically American lines. The additions have been that type of merchandising of the product for which "big business" in America has become outstanding and world famous.

The California Exchange started in 1893 first in an organization of local associations which about 1895 became one federation. Its rise was not spectacular nor phenomenal. Hard work, hard

knocks, education, experience, persistence and faith drew the present highly efficient form out of the rough, troubled, skeptic, ununited group. Today, regardless of what we think in terms of quality, no perishable in the markets in which it has entered is better known than Sunkist, the produce of a co-operative.

In the closing years of the 19th century co-operative endeavor again began its wider and more successful growth. 1903 is generally regarded as the date of this renaissance. Ninety per cent of the fruit and vegetable co-operatives were organized after that date. Seventy-five per cent of the dairy co-operatives have been organized since then. Also the one crop commodity, such cash crops as tobacco, grain and cotton moved toward organization in the years following 1903.

The increase in co-operative organization has become rapid until today there are over 14,000 agricultural co-operatives doing business in the country, aggregating $3,000,000,000 annually.

It is not necessary to go into the details of the relation to this general outline which the hundreds of various co-operatives bear. Suffice it to say that in practically every phase of American Agriculture today there is a sturdy growth of co-operation making itself apparent. There are grain co-operatives, truck co-operatives, fruit co-operatives, cotton co-operatives, tobacco co-operatives—in fact, it would be easier to name the lines which are not co-operative rather than those which are.

Out of this crucible of co-operative development which history brings to light have come several important facts regarding co-operation. Chief among these is perhaps the fact that the co-operative principle is not a cure-all, that there is no set plan, means or method which will fit all individual cases. Equally important perhaps is the fact that business principles, business standards and business efficiency must be inherent in any progress or success which is made by a co-operative. No two co-operatives have the same exact problems. The methods of each must vary according to the commodity handled, its locality, its markets, its type of consumer and innumerable other influences.

The growth of co-operation is to be measured not alone by a yard stick of membership increase and in volume increase but also by an equally significant though less spectacular rule of business efficiency.

History and present success prove the co-operative principle economically sound. It proves its effectiveness in providing economies of production, standardization of products, efficiencies in transportation, broadening of markets and effectiveness of sales.

It is a principle which I firmly believe is the only solution to the present difficulties faced by the Florida citrus industry. We need in Florida more co-operation and less competition. We have more competition now than we can meet when our fruit meets that of Porto Rico, the Isle of Pines, Cuba, Alabama, Texas, Arizona and California in the markets of the nation and the world today. The most serious handicap under which Flor-

ida citrus today operates is that of competition with itself instead of a united front against the powerful and increasing non-Florida citrus competition.

Co-operation in the Florida citrus industry alone can help meet the heavy deciduous competition which is rapidly organizing and making an increasingly powerful bid for the consumer's fruit dollar. I refer to the organization of the apple growers which has provided some four millions of dollars for the consumer and trade promotion of their product in the next three to four years. I refer to the activities of the banana interests, the pineapple interests, the peach, pear and plum interests, which offer competition and serious competition to Florida's citrus fruits. Co-operation of a sincere and earnest type alone can help the Florida citrus industry in meeting it.

We need co-operation in the Florida citrus industry on the part of the nurseries. They can be of great assistance in regulating the trees planted so that marketable and seasonable fruit is made available. A standardization of a good early orange, mid-season orange and late orange with the same standard types of proved grapefruit would go far to help in the sale of Florida citrus. Such action would greatly standardize the production of the state and would facilitate a speedier and more satisfactory sale.

We need co-operation to obtain better and more economical transportation facilities. The improvements which have been made in this respect have been obtained only through co-operation and any in the future can only thus be obtained.

In fact, nearly all of the problems which faced the Danish farmer, and out of necessity produced their highly efficient co-operative organizations, all of the problems which faced other lines of American agriculture and which again of necessity produced today's successful co-operatives in those lines today face the Florida citrus industry in greater or lesser extent. Co-operation has proven itself and has won its spurs in these other lines. Its complete application in Florida is the only final and satisfactory solution to the problems which the industry now faces. Through co-operation and co-operation alone can the Florida citrus industry be stabilized and made permanently and consistently profitable to the Florida citrus grower.

Palms, and Their Use in Ornamentation

Harold Mowry, University of Florida, Gainesville, Fla.

Florida has the enviable distinction of having the most tropical climate of any of the United States, this condition making of it the only one where it is possible to grow a wide variety of tropical and sub-tropical plants under out-of-door conditions. With this condition obtaining there is now a wide variety but a too conspicuous lack in quantity of such plantings throughout the state. Climate alone does not constitute the whole charm of the tropics, the major attraction being more in the plants which lend that indefinable something called "tropical atmosphere." By the free use of the proper ornamentals Florida has the rare opportunity of creating, on a large scale, a tropical landscape and attaining by such plantings that much desired "atmosphere" of the tropics. Of the many plants available for this purpose the palms, as a group, are probably the most truly tropical in aspect and should form the keystone of all Florida's ornamental plantings. It is doubtful if any of the large variety of ornamentals now grown in the state cause or deserve more favorable comment and create a more lasting impression than do the palms.

The palms are among Nature's most striking and interesting trees and there are no plants which can be used as effectual substitutes in a tropical landscape design. Being tropical in requirements they are found, with rare exception, only in the tropical and sub-tropical portions of the world, with the greatest number and diversity of species being nearest the equator. There are approximately 1100 species to be found throughout the world, nearly one-half of which have been classified and described within the past 75 years. Of these 1100 species only 14 or 15 are native to Florida and probably less than 100 have been successfully introduced into the state. There are therefore about 1000 species growing in other countries, many of which, if introduced, would probably thrive in Florida. Every effort should be made to safely introduce these untried species and give them a thorough and fair trial that we may ultimately have all of the world's desirable palms which can be grown under our local climatic conditions.

Palms can be grown in such a limited area that unless they are planted in variety and in quantity we are failing to make the most of our location and opportunities. This not only applies to individuals but municipalities as well. Avenues lined with well-cared-for palms will tend to make for more civic pride and will create impressions that can be obtained

in no other way. A palm-lined street is better advertising than one lined with billboards. The advertising value of palms in our landscaping can be clearly shown by noting in any magazine that the majority of pictured advertisements of tropical resorts will include one or more palms at least in the background if not more prominently displayed. It must be admitted that portions of our state at some times of the year have no more tropical appearance than do some portions of New England. There is no excuse for this condition for with the wealth of species now available there are some palms which will be found wholly suitable to any portion of the state. While it is true that a much wider variety of species can be grown in the southern portions, such palms as the Washingtonia, Sabal, Trachycarpus, Cocos australis type, Chamaerops, Phoenix canariensis and some others are hardy enough to be safely planted in most of the cooler sections.

There is a wide diversity in the various palm species. Some are stemless specimens attaining but a height of a few feet; others are tall, magnificent trees reaching to a height of nearly 100 feet. Some have but a single trunk while others have numerous trunks or stems; the size of the stems varying from a diameter of 2 or 3 inches to massive trunks with a diameter of 2 or 3 feet. The appearance of the trunks also differs greatly in that some are rigidly erect and others bent or leaning; some are very symmetrical from base to apex, others having a more or less prominent bulging or swelling of the stem or base; some are armed with numerous sharp spines, others are clothed with the bases of old leaf-stalks, or "boots," while still others are quite smooth with the exception of more or less prominent leaf scars which give the stem a "ringed" appearance.

As a group the palms may be divided into two general classes according to type of leaf—those having pinnate, or feather-like leaves, and those having palmate, or fan-like leaves. The majority of the species are in the pinnate-leaved class and within this grouping are many of our most desirable and better known palms, as the Royal, coconut, the many Phoenix species, Cocos or Butia, Acrocomia, Caryota, Hyophorbe, etc. The Washingtonia, Sabal, Pritchardia, Rhapis, Archontophoenix, and Livistona are some of the better known representatives of the palmate-leaved type. The variation in the size and form of the leaves is as great as that of the stems, ranging in the fan-leaved species from a small leaf, as in the Rhapis, to huge fans several feet across, as in several of the Sabals. The range of the feather-leaved class includes those having a comparatively small, fern-like leaf, as the Phoenix roebelini, to those, as the coconut, which have massive leaves up to 18 feet in length. There is also a great variation in the coloring of the leaves, the colors including a light yellowish-green to a deep green, ashy gray, and a distinct reddish tint, some dull and others shiny or glossy.

With such a wide available choice in size, foliage, general appearance and hardiness there need be no fear of too

much duplication or monotony of view from the extensive planting of palms. There is always a suitable place for a palm and always a suitable palm for a given place. For every kind of planting, whether it be for grouping, for specimen planting or lining the parkways of streets, there is a choice of several species, any of which will be satisfactory. With ample rainfall, warm temperatures, suitable soils and numerous species readily available there is no legitimate reason why Florida could not and should not in a few years be rightfully termed "The State of Palms."

The listing or giving of even brief descriptions of the many species growing in Florida is too lengthy a process to be of much interest in a paper of this sort but it is suggested to those who may be interested that they obtain a copy of Bulletin 184 of the Experiment Station which deals solely with the palms of this state.

A Few Remarks on Fruit Splitting

F. M. O'Byrne, Lake Wales

Any of you who are in the fruit business, recall that last year was a very serious year as regards the splitting of Valencia oranges. If you didn't have any valencias, perhaps this is not quite as painfully stamped upon your mind, but every year about the first of September our trouble with splitting starts. Last year it was so acute I wrote an article in one or two of the papers, and I was surprised by the large number of letters I received. I took the matter up with the Experiment Station, to find whether there was someone who could do something for us on splitting. There is no sum provided for in the present budget for it; they felt they were having trouble enough already with their budget. So I talked with the legislator from our county, who gave me this advice. He said "It is serious enough so I will be glad to introduce a bill and work for it, to see there is money provided for the splitting problem, and I believe it will have no difficulty in passing." From my experience with the State Plant Board, I thought that $20,000 was necessary to provide for the salary of a man for two years, his traveling expenses, the equipment for the laboratory, and some traveling expenses for his assistant, but in taking it up with Dr. Camp today, he said that perhaps a smaller sum, $15,000, would be sufficient to put it on its feet for two years.

I would like to see the hands of people in the audience who would be willing to write their legislator, and ask him to support a bill to provide $15,000 for scientific work on the problem of controlling splitting in Valencia oranges. (Numerous hands raised, and names taken by Mr. O'Byrne.)

Successful and Economical Method of Loading Citrus Fruits

H. B. Stevens, DeLand, Fla.

The aim of every grower should be to get his fruit to the market in the best condition possible, and at the least cost.

We all believe the freight cost is too much, but the freight agents tell us that there is so much paid out on claims made for fruit arriving in bad condition, that they are compelled to charge more for hauling fruit to meet these claims.

We can in a measure help ourselves in this matter by lessening the cost of loading our fruit, and at the same time having it arrive in the market with less breakage, and waste, by following a different plan of loading. At present, the rule is to put the boxes in six rows, and strip both the bottom and top rows, at a cost of about $6.95 per car, when three cars are loaded a day, and three hundred and sixty boxes per car. Placing the boxes in six rows, gives so much space between rows that should one box break loose, it will tumble around and loosen others, and so multiply the damage by the time the end of the journey is reached; while if they were put in seven rows and loaded so as to make each row tight, lengthwise, with the car, there would be almost no shifting, and the space being so small between rows, they could not move much anyway, so no breaking will be done.

Perhaps, some may think that would not give air space enough. How much space is required for air anyway? If you are shipping under refrigeration your car is closed up tight, and no air is moving in the car. All that is in the car is cold, and you have plenty of space with seven rows in the car. If standard ventilation, the air passes under and over the fruit, and through the space between the rows even if that is not more than two inches wide. Cars loaded this way can be loaded at a cost of $2.33 per car, a saving of $4.62 per car. This would mean a saving on three hundred cars, of $1,386.00. Having practiced stripping so many years it is not easy for one to see how fruit not stripped, can arrive in as good condition, when loaded without stripping.

Three cars went from DeLand to Boston this winter, arriving on the same day. Two were not stripped, and one was. The two arrived in good condition, no breakage or damage in transit. The stripped car arrived with some boxes broken and had to be coopered, with a shrinkage of four boxes. Last season, three cars of fruit were ditched not far

from DeLand, one was a car not stripped, while tipped pretty well over, was gotten back on the track without unloading, and with four hours delay, arrived in Boston in perfect condition, and no boxes broken and no decay.

This method of loading has been in use for many years, but we have said nothing about it, as we did not know we were saving so much in the cost of loading.

This season the railroad inspectors were saying we would be compelled to strip, or they would pay no claims. We then got busy and got affidavits from the other end as to how our fruit was arriving. One statement was that the party had handled our fruit for fifteen years with only one claim, and that was not on account of the way the fruit was loaded, but because the car was in a wreck.

Finally, one of the railroad officials came to see how we loaded our cars, and made a sketch and took photographs of the loading. He gave permission to a neighboring packing-house to load his cars the same way, and, he tells me that all the cars he has loaded this way, have been arriving in satisfactory condition.

Now, if this method were generally adopted, it would mean not only a saving in the cost of loading but less claims on the railroad for breakage and would make a strong argument for the reduction of freight rate.

Pecan Growing in Florida

G. H. Blackmon, Pecan Culturist, Florida Agricultural Experiment Station

The pecan is one of the most important horticultural crops of north and west Florida, comprising some 40,000 acres in orchard plantings as well as a large acreage being devoted to the growing of nursery stock.

Pecan orchards that are being planted at the present time are made up largely of smaller plantings on farms as a part of the general plan to encourage and promote a continual income, which is placing the industry in a position where it will help to maintain the annual return of the farm in a very material way.

IMPORTANCE

As a product for human consumption, there is nothing that will take the place of the pecan nut when properly used in the home menu. It is delicious in soups, salads, loaves, breads, cakes, pies and candies, as salted, fresh and many other ways that could be mentioned. In fact there are so many ways to use pecans in the regular daily food that it has required a book containing more than 300 pages in which to partially list the recipes for preparing various pecan nut foods.

AREA OF COMMERCIAL PLANTING

The area of commercial pecan production in Florida is the western and northern part of the state extending south to about the latitude of Gainesville. Around homes, in most all parts of the state, there are to be found a few trees that bear crops of nuts, some rather regularly, while others are less reliable. There are, also, some orchards located outside of the area defined, that are, in a few instances, fairly productive, but generally the climatic conditions and other factors are not such as to encourage the present varieties to yield nuts in quantity. It is possible that somewhere in the future there may be a variety developed or introduced that will extend the industry into the southern part of the state but until such has been done, commercial plantings are not to be recommended outside of the area outlined.

SOILS

The pecan will succeed on a great variety of soils if they are properly drained and sufficient care is exercised in maintaining fertility, humus and moisture in proper amounts. The prospective planter cannot be too careful in selecting the soil for the orchard with reference to hardpan, quicksand and water-table for these should not be closer than five feet of the surface. Trees planted on soils not suited will make a very poor growth and will develop rosette to such an extent that they will be unprofitable unless precau-

tions, which are generally very expensive, are taken to correct the trouble.

The soil best adapted to pecan growth is a sandy loam, slightly acid, with a good porous clay subsoil that admits proper root development, but will not permit the leaching of plant foods and loss of moisture to an excess. It is very important to maintain a constant moisture supply, as soil moisture for the growth and development of the tree and nuts depend largely on the uniform supply of moisture.

TRANSPLANTING

Pecan trees are not difficult to transplant when the soil is put in good condition and care is exercised in placing the roots when setting. The holes should be dug 18 to 24 inches in diameter and 24 to 30 inches deep, or sufficiently large to admit all roots without crowding and bending. Lay out the orchard for the trees to be not less than 50 feet apart each way, but sometimes a greater distance is advisable. Use only surface soil around the roots, and when the hole is three-fourths full pour in three gallons of water and when settled thoroughly, finish filling, leaving a dust mulch on the surface. When the job is completed the tree should stand not more than one or two inches deeper than when it grew in the nursery.

CULTIVATION

It is important that a method of cultivation be practiced that will maintain the plant foods, moisture and humus. The pecan thrives best on soils high in humus. It is, therefore, necessary to turn under large amounts of green material or manure to get best results. The ideal way to handle an orchard is to cultivate clean during last of March, April and first of May and then plant a cover crop of beans or some other good legume to be turned under in September, then cultivate clean until nut harvest, when a winter crop should be planted of oats and rye, mixed or separately. The soil should be turned completely at least once each year, just deep enough to cover all vegetation, but twice would be better if there is sufficient growth to be added to the soil, otherwise, thorough discing will be all that is necessary, except the turning in of the rank growth of cover crops.

INTERCROPPING

An economical method to care for the young orchard until bearing age, is the growing of some cash crop between the tree rows. Care must be exercised to keep the crop a sufficient distance from the pecan rows or injury to the trees will result, which will be greater than the saving accomplished. When practicing this method of orchard cultivation, provision should be made to return to the soil at least one rank growing legume for the purpose of adding humus and nitrogen.

Regardless of the method of cultivation, it is advisable to run a disc around the tree rows for the first three or four years to maintain a dust mulch and to keep vining cover crops from growing over the young trees, cutting off light and air and crowding them down. In bearing orchards it is necessary to plow

or disc the orchard soil prior to harvest, otherwise, a large percentage of nuts will be lost in the vegetative growth.

FERTILIZERS

Pecan trees must be fertilized properly to insure growth and production. The fertilizers should be made so as to have nitrogen available as it is required. It is, therefore, advisable to use inorganic sources to supply one-third of the nitrogen and organic to supply two-thirds. When thus used in the mixture the nitrogen is available as it is needed. The phosphoric acid and potash can come from acid phosphate and sulphate of potash respectively.

A fertilizer analyzing 6 per cent nitrogen, 8 per cent phosphoric acid and 4 per cent potash will give good results, when used the first five to eight years after planting, if applied at the rate of 4 to 20 pounds per tree, depending upon the age and size. For older trees use a fertilizer analyzing 4 per cent nitrogen with the other materials the same as indicated above, making a 4-8-4, which should be applied at the rate of 10 to 75 pounds per tree depending on size and age. Application of the fertilizers should be made in March about two weeks prior to date the trees force into growth.

VARIETIES

The prospective planter cannot be too careful in selecting varieties to plant. There are comparatively few that are to be recommended for planting in the state. They are listed under two groups; those producing large nuts of 60 or fewer to the pound and those requiring more than 60 to weigh a pound.

The Big Nut Crop — Schley, Stuart, Success, Frotscher, Pabst.

The Small Nut Crop—Curtis, Moore, Kennedy, Randall, Moneymaker.

Everyone wants to grow the Schley, but owing to the fact that it is very susceptible to pecan scab it should not be planted unless the disease is to be controlled, which can be done by spraying with Bordeaux Mixture. Plant only three or four well chosen varieties, and by the proper selection of them from the list submitted one will have taken an important step in the right direction in becoming a successful pecan grower.

Fruit Growing and Fruit Grades

J. C. Merrill, Manager Highland Citrus Sub-Exchange, Leesburg, Fla.

A grower should use care in the selection of land for a grove, as this past winter has proven very costly to those not so careful. He should have the advice of some one familiar with local soil conditions. See that the land is well drained—good soil and has good air drainage. If possible get land free from hollows, as trees planted in these places invariably are damaged by frost when the thermometer hovers around freezing point.

After clearing, plowing and disking, land should be staked at the required distance. Some prefer the rows 25 feet each way and others 30 feet apart.

The varieties to be planted are very important as this has to do with the future income to be derived from the grove. There is a general complaint from the dealers and consumers that Florida has too many varieties. California has two—the Navel and Valencia. Three varieties of oranges are ample for Florida. The Parson Brown, Pineapple and Valencia are most popular and profitable; these are the early, mid-season and late varieties. The Dancy tangerines and Conners Prolific or Duncan, and Marsh Seedless grapefruit should also be planted. I think it well to plant some of each of the above varieties as we should have diversification in fruit crops as well as general farm crops.

The root stock is next to be considered. If you have high pine land with light sandy soil, plant trees on rough-lemon stock. If your land is heavy pine or hammock, plant sour-root stock.

In planting, do not let the sun dry the roots. Wet the soil thoroughly while packing it tightly around the roots.

During the first four years, trees should be cultivated every two weeks from March 15th to September 15th. Use a disk harrow or plow the first time and an Acme harrow the remainder of the period. It is best to make four applications of fertilizer per year, at intervals of six weeks beginning March 15th. Use a 4-8-3 formula the first three times and a 3-8-5 in the fall. The amount of fertilizer per application depends on the fertility of the soil. Ordinarily one-half to one pound per tree at each application during the first year; one pound to one and one-half pounds the second year; one and one-half pounds to one and three-fourths pounds the third year; about two pounds per tree the fourth year.

Trees four years old—if on rough-lemon stock—will bear enough fruit to pay for their keep. If on sour

stock it will take two years longer. Therefore, we should consider the quality of fruit we are going to produce, as well as the growth of the tree. At this time we cut the applications of fertilizer to three per year, and use a formula with less ammonia and more potash, especially in the summer and fall. As the trees grow older, you increase the amounts from one to two pounds per application, this depending on the condition of trees and amount of fruit they are carrying. The general practice is to make the first application of fertilizer in February. Work it in with a disk harrow, being careful not to cut deeper than three inches, then use an Acme harrow every two or three weeks. This will conserve the moisture and keep your trees and fruit growing. The last of May put on your summer application. It has been found that the use of a high percentage of phosphoric acid at this time, will improve the quality and hasten the maturity of your fruit. After working in the fertilizer, do not disturb the soil again until you fertilize in November. If you have no natural growth of grass, plant a cover crop. Mow the grass about twice during this period. Upon the completion of the November application, plow your land and harrow it. This gets your cover crop under the ground, conserving the humus and moisture and protects the grove from fire.

In a well cared for grove the pruning is usually light. It should be done during the winter while trees are dormant, but most growers are busy harvesting their crops, and in the spring fertilizing, spraying and working their groves, so midsummer is the most convenient time to prune. This consists mainly of cutting out all water sprouts, weak and overshadowed branches and dead wood.

Spraying and dusting are very necessary in order to produce high grade fruit. Information regarding the insects and diseases and their control can be obtained by applying to your County Agent, the Experiment Station or the United States Department of Agriculture.

The grading of fruit is a very important factor in the marketing of it. There are approximately one hundred and forty marketing organizations in the state, and they vary considerably in their methods of grading. This condition causes confusion among the buyers, as one shipper will quote his brand at one figure, while another shipper will underquote that price from 25c to 50c. A brand does not mean anything to a buyer unless he handles it continually. The only remedy, as I see it, is to have a law compelling each shipper to mark his package according to the grade it is. The United States Department of Agriculture has established grades to meet every requirement. U. S. No. 1, U. S. No. 2 or Unclassified marked on each package gives the buyer a basis on which to judge values.

Producers of fruits and general farm products, the country over, are awakening to the fact that standardization is absolutely essential to the successful marketing of that product. At the Fruitman's Club Meeting held last November, a resolution was passed wherein they agreed to use the new standards of

grades, U. S. No. 1 and U. S. No. 2, as recently adopted by the United States Department of Agriculture. The U. S. No. 1 grade is a consolidation of brights and goldens, with not more than 10 per cent russets of that grade. The U. S. No. 2 grade includes the brights, goldens and russets of that grade run together. This method of grading has been used by some of the largest packing houses in Orange and Lake County for several years, and as they met with success in selling fruit graded in this way, other houses gradually adopted it until now a large number of packing houses are using this method. It is a grade showing quality and texture instead of color. It has many advantages over the old method.

It is more economical for a packing house to grade in this manner as the less grades you make the less expensive it is to operate a house. It gives longer lines of one size fruit which is very desirable, especially on auction cars. It assists the dealer in selling as when he has a call for a certain brand. If they are all U. S. No. 1 or U. S. No. 2 he does not deliver all bright fruit at one time and all russets the next. If he should do the latter there surely would be a kick, though there really is not any difference in the eating quality of the fruit. In order to establish standardization of grades and pack by all shippers of citrus, we must agree on one organization controlling it. It must be done by a disinterested party.

The Federal Inspection Service, as offered by the United States Department of Agriculture, is valuable to all shippers for the following reasons:

1. Promotes grading and standardization of farm products.

2. Secures uniform application in different sections of recognized standards.

3. Enables shippers to correct errors in grading and packing at their source rather than adjust them at destination.

4. Is a strong advertising point and so assists in making sales.

5. Gives distant buyers an impartial report on quality and condition of products which he is purchasing.

6. Assists in forcing acceptance of products which are up to grade.

7. Shipping point certificate, together with receiving point certificate, furnish valuable evidence for use in adjusting claims against carriers.

8. In case of litigation, gives shipper prima facie evidence of quality and condition of his products in courts of the United States in which the certificates are issued.

9. Assists co-operative shipping organizations to deal fairly with members who are pooling their shipments by insisting on delivery of uniform quality produce.

10. Assists managers of large shipping organizations in checking up the work of local representatives.

This service has been much used by the citrus fruit shippers this year as a means of assuring buyers that their fruit met grade requirements and was free from injury resulting from the freezes which occurred during the early part of January.

Methods of Detecting and Measuring Frost Injury

E. M. Chace and C. G. Church, Los Angeles, Cal.

The problem of handling frost-injured fruit is as important to the growers and shippers of citrus fruit as it is to the officials acting for the various states and for the Federal Government in regulating its shipment.

The phase of the problem presented to the chemist has several aspects. He may be concerned with the detection and measuring of frost injury, with methods of eliminating the frosted fruit, or with its utilization as by-products. The first aspect mentioned is the one which has occupied our attention during the past season in Florida. The others have been covered by articles printed in the California Citrograph and the California Cultivator. (1, 2, 3.)

The detection of frost injury has two phases—the detection within a short time after the injury takes place, and detection after the fruit has remained on the tree or in storage for some time after the freeze. The difficulty, of course, is to correlate the changes taking place immediately with those which are subsequently apparent. Measuring the injury after its detection is also a vital part of the second phase of the problem.

The first phenomenon apparent after the fruit is frozen is the water-logged appearance of the pulp. This change takes place very shortly if not immediately after freezing. After this, the areas on the fruit that are exposed to the sky become lighter in color, the result being what growers know as "shiners." Next in the order of appearance is the deposition of the white crystalline masses in the segment walls of the fruit. This deposition occurs often within twenty-four hours, usually within forty-eight. These crystals were absent in about 10 per cent of the samples of California frost-injured fruit examined by us, and in nearly 33 per cent of the Florida fruit. Grapefruit samples which we have examined have shown no crystals, and Temple oranges have them less frequently than Seedling or Valencia oranges. Often the crystals can be seen in the flesh of frozen tangerines and in severe cases of injury they are found also in the pulp of oranges. These crystals respond to chemical tests used in detecting hesperidin. They can be produced in the fruit by heating it to 140° F. for two hours, by submitting it for several hours to vapors of alcohol in a closed vessel, or by the use of a dehydrating agent on the segment walls. Although the white crystals are more or less characteristic of frozen fruit, tests

for hesperidin itself can be obtained by using the segment walls, pulp, peel, or even the juice of unfrozen fruits. The presence of the uncrystallized glucoside is, therefore, not an indication of frost injury. Nor, unfortunately perhaps, is the presence of the crystalline deposits an indication that the fruits containing them will eventually desiccate or rot.

Almost immediately after freezing the fruit begins to lose moisture and this loss usually continues until the injured parts are dried out. As fruit remains nearly the same size after being frozen, and as the deterioration of the solid matter is relatively slow, the result is at once apparent in the specific gravity. Unfortunately, as has also been shown by others (2, 3, 4), the specific gravity of the fruit is too variable to permit the accurate separation of the frozen fruit by its specific gravity alone. Oranges of high specific gravity can desiccate more than 20 per cent and still have a higher gravity than some normal oranges.

After harvesting, normal oranges increase in specific gravity, owing to loss of moisture. Frozen oranges, owing to the decomposition of the injured parts, which tends to offset this gain, increase in specific gravity at a slower rate, or, in cases of severe damage, even decrease. This fact can be used to advantage in predicting the extent of frost injury. With few exceptions fruit that on storage for ten days is lower in specific gravity than when it was stored, will eventually desiccate more than 20 per cent.

The table shows the rate of change in specific gravity on Florida oranges correlated as nearly as possible with the estimated frost injury.

In estimating the frost damage in the samples, the oranges were cut between the stem and center, at the center, and between the center and blossom end. The average estimated desiccation was taken as the total desiccation. All fruits having 1 per cent or less were classed as normal; those having more than 1 per cent and up to and including 10 per cent were classed as slightly frosted; and those showing more than 10 per cent total desiccation were classed as frosted. In making this table, the average desiccation shown by each group was taken in order to give comparable figures. It is thought that the data on Valencias and Seedlings are fairly accurate. Those for the Cunninghams and Budded are the result of too few tests to be representative. The figures on grapefruit are not satisfactory, as here also the number of samples was small. The average of all samples of oranges irrespective of variety is also shown.

The average gain in specific gravity over a ten-day period for normal oranges varies from +0.0090 to +0.0169, with an average of +0.0136. Slightly frosted fruit, the average being about 6 per cent frost damage, change from −0.0006 to +0.0088, the average being about +0.0044. Frosted fruit samples, the average being about 25 per cent frost damage, show a change in specific gravity from +0.0016 to −0.0173, the average change being a loss of −0.0083.

The data on grapefruit indicate that the method is probably not applicable to that fruit. Owing to the great variation in the character of the rind, the evaporation is probably so great from this part of the fruit as to offset the changes due to decomposition.

The data available on California oranges indicate that normal navel oranges make an average gain of +0.0190 in ten days, while those which were desiccated 20 per cent or more at the center have an average loss of −0.0150.

This method may afford a means of estimating the extent of frost injury immediately after the freeze, for it is evident from the data that samples of fruit that show a loss in specific gravity over a ten-day period are probably damaged to such an extent as to become unmerchantable.

The rate of dehydration is not as satisfactory for estimating the frost injury as is the change in specific gravity.

The color of the juice of frozen oranges is lighter than that from normal fruit, its conductivity is slightly greater, and its viscosity slightly higher. We have, however, been unable to base any simple method for measuring frost injury upon these facts.

When the question of merchantability of the fruit is in consideration, several methods of measuring the injured portions can be found.

The first of these is one that will appeal to everyone as a satisfactory measurement of the desirability of a fruit. As the fruit dries out the juice decreases in quantity and the proportion of juice to the size of the orange becomes less. The difficulty with a test of this kind is to find a method that will satisfactorily determine the quantity of juice. For this purpose we have used a Sealdsweet or Sunkist extractor. After removing the juice and pulp, the mixture is placed on cheesecloth and squeezed dry by hand. As nearly as can be estimated, the results are accurate within 2 to 3 per cent, which is near enough for practical purposes.

The table shows the quantity of juice obtained from normal and frozen oranges and grapefruit.

The normal Florida oranges yielded between 58.5 and 61.5 per cent of their volume in juice, the slightly frosted oranges gave from 48.4 to 58.4 per cent, and the frosted samples gave only from 39.2 to 48.0 per cent.

California Valencia oranges yield between 50 and 60 per cent of juice for the normal fruit, and from 35 to 45 per cent for fruit so badly damaged as not to pass the Federal test. No data for California navel oranges are available.

As a whole, this determination seems to be the best fitted to estimate the actual value of a frost-damaged fruit.

Another possible measure of frost injury is the specific gravity of the peeled fruit. When the gravity of the whole fruit is taken, the data are affected by the physical condition of the fruit, such as the thickness of the peel and hollow centers. With peeled fruit these sources of error are eliminated and the results are much more uniform. The table includes data on the specific gravity of normal and frozen oranges from Florida.

The specific gravity of the peeled fruit on normal samples of Florida oranges is in excess of 1.03, that on slightly frosted fruit averages about 1.01, and that on frosted fruit ranges from about 0.928 to 0.984. For California oranges, the dividing line between passable and not-passable fruit is about 0.975 for navels and 0.950 for Valencias.

No purely chemical method seems available for detecting or measuring frost injury. The most striking chemical change that we have found is the loss in acidity of the juice which follows freezing. This loss begins probably at once, for it is noticeable within forty-eight hours and is very pronounced within a few weeks, whether the fruit is harvested or left on the tree. The loss in sugars takes place less rapidly but is manifest in all cases where the injury has been severe. So far as our work shows at this time, there are few other chemical changes. The relation between cane and invert sugars remains unchanged. The nitrogen distribution is stable save for a slight but consistent increase in amino acids.

COMPARISON OF NORMAL AND FROSTED CITRUS FRUITS

Type of fruit	Condition	Change in sp. gr. of whole fruit: No. samples	Desiccation %	Change	Sp gr. of peeled fruit: No. samples	Desiccation %	sp. gr.	Per ct. juice by vol.: No. samples	Desiccation %	juice %
Seedlings	Normal	57	0.02	+0.0154	24	0.25	1.0330	19	0.1	60.7
	Sl. frosted	54	5.3	+0.0046	27	5.6	1.0094	10	4.6	58.4
	Frosted	65	25.0	—0.0173	45	24.9	.9315	10	29.0	45.4
Valencias	Normal	50	0.1	+0.0169	27	0.04	1.0336	3	0.3	59.0
	Sl. frosted	26	5.9	+0.0088	22	6.3	1.0123	2	5.0	56.2
	Frosted	29	24.4	—0.0038	22	19.5	.9839	7	40.0	41.2
Cunningham Sweets	Normal	24	0.1	+0.0090	25	0.12	1.0345	....	.....	.....
	Sl. frosted	9	5.0	+0.0023	9	5.1	1.0162	....	.....	.....
	Frosted	13	30.0	—0.0127	13	30.0	.9277	....	.....	.....
Lue Gim Gongs	Normal	7	0	+0.0158	....	.....	.....	7	0	61.5
	Sl. frosted	15	5.8	+0.0070	....	.....	.....	15	5.8	55.4
	Frosted	3	14.0	+0.0016	....	.....	.....	3	14.0	48.0
Budded	Normal	17	0	+0.0111	....	.....	.....	16	0	58.5
	Sl. frosted	6	9.2	—0.0006	....	.....	.....	6	9.2	48.4
	Frosted	19	32.0	—0.0106	....	.....	.....	19	32.0	39.2
Averages, all oranges	Normal		0.04	+0.0136		0.14	1.0337		0.1	59.9
	Sl. frosted		6.2	+0.0044		5.7	1.0126		6.1	54.6
	Frosted		25.1	—0.0083		24.8	.9477		28.8	43.4
Grapefruit	Normal	31	0	+0.0236	28	0	.9917	....	.....	.....
	Sl. frosted	1	3.0	+0.0132	0	....	.....	....	.....	.....
	Frosted	19	49.0	+0.0011	15	56.5	.9175	....	.....	.....

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Contributed from United States Department of Agriculture, Bureau of Chemistry, Laboratory of Fruit and Vegetable Chemistry, Los Angeles, California.

Fruit-Frost Service

J. B. Kincer, Weather Bureau, U.S. Department of Agriculture
Washington, D. C.

Mr. Chairman and Members of the Association:

Temperature, frost, and what we are going to do about them, are the things I propose to discuss most this evening. In order to understand and appreciate the principles that are involved in frost protection, it is necessary to consider for a few minutes the fundamental physical conditions that serve to keep our atmosphere warm. The air is the great heat regulator of the earth. It comprises a very thin envelope of protection, but is sufficient to keep us reasonably warm.

The sun, of course is the source of practically all our heat, and its energy comes to us in wave-like motions, those of longer length appearing as heat, and most of the shorter as light. The incoming solar rays on passing through the atmosphere to the earth lose a portion of their energy and on reaching the earth are in part reflected and larger part absorbed. Now the absorbed portion of this energy is eventually radiated away in long wave lengths, and the atmosphere in great measure absorbs this long wave length radiation. In other words, it can not go back through the air into space as readily as the Solar radiation came through from the other direction. Under these conditions the earth warms rapidly and the lower, warmer layers of air expand, become lighter, and are forced upward by the heavier surrounding air. Thus heat is carried back through the atmosphere, perhaps 2,000 or 3,000 feet during the day-time.

Now, at night the reverse operation occurs. In the absence of the sun, radiation from the earth continues, and the surface becomes very much colder than the overlying strata of air. When this occurs heat is given off from this lower air to the earth, and the air near the surface frequently becomes much cooler than that a short distance above. This is one way by which the atmosphere is cooled enough to produce frost and is usually called a radiation frost.

Another way of cooling is through the influx of cold air brought about by certain atmospheric pressure conditions, the kind that produce the anti-cyclone. In our latitude air is practically always controlled by two systems of winds, one the cyclone; the other the anti-cyclone. The term cyclone doesn't mean a tornado. It means any

extensive system of winds that blows spirally in a direction oppositely to the movement of the hands of a clock, around a center of lower atmospheric pressure than anywhere else in the system. The anti-cyclone has a central area of high pressure around which there is a general movement of wind blowing in a direction opposite to that in the cyclone. These pressure and wind systems follow one after another in succession usually from west to east. The front of the anti-cyclone is characterized by northerly winds and usually clear weather. During winter they are responsible for our cold waves.

The question as to the frequency of temperatures harmful to citrus fruit is of much concern to you and I have some records here that give us this information. I am not showing you these to intimate even that Florida is not a good place to grow citrus fruit, for we all know better than that. You have occasionally, some rather low temperatures, and I think it is well to know just how frequently this kind of thing occurs. If we make up our minds to fight Jack Frost, it's half the battle to know about how often he charges and how severe the attacks will be. Records of this kind tell us these things. About the middle of January this year there was a rather severe freeze and we have endeavored to indicate on chart I the occurrence of all low temperatures comparable to this during the last 100 years. The only record of this length is that for Jacksonville where the temperature on January 16, 1927, went as low as 22°. The chart shows that 24 years of the past century have had temperatures as low as this, and that the intervals between the occurrences range from one year to a maximum of 11 years. The average interval is about four years. You will note that the occurrences are very irregular; one freeze may be succeeded by another

TABLE I

RECORD OF TEMPERATURE 22°, OR LOWER, AT JACKSONVILLE, FLORIDA

Month	Year	Min. Temp.	No. yrs. since last occurrence of 22°
January	1832	22	
February	1835	8	3
December	1845	20	10
February	1849	22	4
January	1852	20	3
January	1857	16	5
December	1868	20	11
December	1870	19	2
December	1880	19	10
January	1884	21	4
January	1886	15	2
January	1887	22	1
December	1894	14	7
February	1895	14	1
January	1897	21	2
February	1899	10	2
February	1900	18	1
December	1901	20	1
January	1905	17	4
December	1909	19	4
February	1917	16	8
January	1918	21	1
February	1924	21	6
January	1927	22	3

the following year and, on the other hand, you may be fortunate enough to go as long as 10 years, but this is about the maximum.

On Table II appears records for Brooksville, showing first, the number of days with freezing temperature, or lower, and second the lowest temperature recorded for each year since 1892, or a period of 35 years. In this case nine of the 35 years had temperatures as low as 22° or lower. This is about the same ratio as at Jacksonville, and here again we find no regularity in the occurrences of freezes. In fact an exhaustive study of some 6000 weather records on file in the Weather Bureau for every section of the country does

TABLE II

MINIMUM TEMPERATURES—BROOKSVILLE, FLORIDA

Winter of	No. of days with min. temp. 32° or lower	Lowest temps. of winter
1892-93	8	27°
1893-94	0	33°
1894-95	7	*16°
1895-96	6	29°
1896-97	3	24°
1897-98	3	23°
1898-99	6	18°
1899-00	8	21°
1900-01	7	27°
1901-02	15	22°
1902-03	5	25°
1903-04	6	24°
1904-05	13	18°
1905-06	0	34°
1906-07	5	24°
1907-08	8	28°
1908-09	2	23°
1909-10	5	22°
1910-11	7	25°
1911-12	7	27°
1912-13	0	37°
1913-14	0	34°
1914-15	8	26°
1915-16	19	24°
1916-17	14	20°
1917-18	17	22°
1918-19	8	25°
1919-20	19	24°
1920-21	8	31°
1921-22	6	27°
1922-23	4	24°
1923-24	8	27°
1924-25	2	26°
1925-26	13	26°
1926-27	4	22°

*Feb. 7; also 17° on Dec. 28.

not disclose sequences or cycles of any weather phenomena that are definite enough to warrant long range forecasting. There are, we admit recognized tendencies for similar conditions to appear again at certain intervals of time, but we cannot say, for example, that a certain temperature condition will occur again at a stated future time with any assurance of fulfillment. Forecasts of this kind may be lucky now and then, this we naturally expect, but in the long run the misses will be more numerous than the hits whenever a definite forecast for a particular place is made. I may say

also that, as yet, it has not been demonstrated that any known or suspected solar phenomena has an influence on the weather sufficiently marked or definite to be of practical value in long range forecasting, or at least if they have, that fact to the present time has not been established.

Usually the cold waves of this country start in the Northwest and whether they come through to Florida depends upon what is present down here. If the path of the preceding low pressure area, or cyclone, happens to be well south or over the southeastern states, the succeeding "high" with cold weather is likely to come through. On the other hand, if high pressure prevails over the southeast there is little likelihood that Florida will be affected by a northwestern cold wave.

Now the question is, after we know what kind of weather we are likely to have, and how often we may expect a frost, what we are going to do about it. That is a question hard to answer, as much depends on the individual grove and its location as to natural advantages in air drainage and other conditions that afford some protection. How much protection will be required and the relative amount for different groves are questions difficult to answer also until a temperature survey has been made.

As to the best method of protection, there are a number of ways by which we can prevent moderate freezes, theoretically, from injuring our fruit. We have just learned that there is often a cold layer of air next to the earth, with higher temperature above. Sometimes the cold air extends a very short distance upward with the boundary between the cold and the warm air so sharply drawn that the fruit in the top of a tree may be uninjured and at the bottom frozen. The question then arises, "why not stir up this lower cold air and mix it with the warm air just above, in order to get a uniform temperature." This has been tried, a great deal of work has been done, and a lot of money spent on it; at least a dozen machines have been built to accomplish the desired result but all efforts, so far, have proven unsuccessful. I was out in California recently and went out to see one of these "wind-jammers" as they are called. A man had spent several thousand dollars in building it but finally gave it up and had orchard heaters installed.

There is another principle in frost protection, and that is to retard loss of heat by radiation from the earth's surface. On a clear night heat radiates rapidly and if we could reduce the loss it would be a great help. This is effected for small truck by covering the plants. Most anything will do; provided it is a poor conductor of heat; paper is good, but glass is best though too expensive.

It has been suggested, "why not make tents for your trees." Considerable experimental work has been done with tents. One trouble is the inconvenience of getting the tent on the trees and taking it off again; also tests

of temperatures under the tent and outside have been rather disappointing.

Another custom and so far the most successful is to heat the lower strata of the air. Before saying anything about this, however, I want to mention a few of the silly things that have been proposed; for example one man thought that we should hang bars of iron in the trees. If you put an iron bar out at night, in the morning it is colder than the air. He reasoned, therefore, that it drew the cold out of the air, and took it all into the iron. Another was to explode dynamite above the trees to break up the frost as it is "falling." Another was to string cotton thread across the trees and dip the ends into pails of water, so as the frost "came down" it would run off into the water. A man actually got a patent on that thing. These are only samples of the many we have received.

If heating is best, how should it be accomplished? There is no special virtue in any particular kind of fuel. The thing to be considered most is convenience and the dependability of the heat, but at the same time the physics of the thing make it very desirable to have a comparatively large number of moderately hot fires so that the heat may be uniformly distributed near the ground throughout the grove. Too much heat at a single place and the difficulty in keeping the fires burning uniformly for long enough time are the principle objections to wood fires, for as soon as we overheat any particular area, the air is going to rise too rapidly from it and much of the heat will be lost—carried into the upper atmosphere. The most successful heat is that created by modern orchard heaters burning a cheap crude oil.

Orchard heating in California is somewhat different from what it is here. They have some advantages over Florida conditions and Florida has some advantages over them. Most of the freezes there are due to radiation conditions where there is only a thin layer of air to heat, but their 1922 freeze was a windy one, and they came through it alright with their heaters. You more frequently have wind with your cold waves, but on the other hand, while it's harder to heat with the wind, in California they may have to heat many nights in succession, while you rarely have to heat more than one or two. Moreover their freezes frequently occur more than once during the winter, but you seldom have more than one a year. In the winter of 1894-95, you had more than one, but that is exceptional.

The fruit-frost service of the Weather Bureau has been organized to assist fruit growers in protecting their orchards from frost. It consists primarily in making temperature surveys, giving advice as to requirements for successful heating and forecasting pending harmful temperature conditions. It is a very important preliminary to a heating operation to make a temperature survey of the locality. I overheard a remark today—a gentleman said that one thing this last freeze did for him was to point out his cold

spots. That is an indication, of course of radiation, as we usually get cold spots only under radiation conditions. They are brought about by air drainage; though the slope may be gentle, when the air becomes cold it drains down, making the higher land comparatively safe. Protection is comparatively easy under such conditions. If you are going to heat, these cold spots should be pre-determined. In other words, we should know these cold spots before a frost comes along and points them out for us. You can put thermometers in your orchard and determine where these pockets are and when you heat you will know these are the ones you will have to fire first and also provide extra fuel and heaters. Perhaps, even, much of your grove may not need to be heated at all.

Now the Weather Bureau has seven or eight men out in the Pacific coast states who are engaged in this fruit frost work. Part of their work is the making of temperature surveys of this kind. To survey a district one man will have about forty meterological stations, using standard equipment, including thermographs, which make continuous records of temperature throughout the day and night. He establishes a key station that represents the general condition of the neighborhood, and then compares the temperature there with readings in many other districts and thus locates the cold pockets. When frost impends, he makes a forecast for the key station and by comparison it can be determined approximately how cold the others will get.

In addition to this, they test thermometers for the growers, and give advice on many questions of heating. We recently tested 1400 thermometers in one batch for the California Fruit Growers Exchange; they sell these to the growers at cost. Your thermometer is an important thing. If you buy one, be sure it is a good one, and have it tested.

Member: Where do you get them?

Mr. Kincer: The Taylor Instrument company of Rochester, N. Y., and H. J. Green, Brooklyn, N. Y., are good people. You want a minimum thermometer.

Member: Do they stamp them when tested?

Mr. Kincer: If you are close to a weather bureau office you can have it tested there.

Member: What do they cost?

Mr. Kincer: A good one will run around $4 or $5.

Vice-President Poole: Can we, in Florida, get the same service that is being given to California?

Mr. Kincer: We had a letter from your agricultural college at Gainesville just before I came down asking about a fruit frost service for Florida. We haven't at this time any funds for such a service. Perhaps you may not

know that the California service came about by a special appropriation from Congress for that purpose. It is sponsored by the California people. We started out there with one man, and when they saw the work he was doing they got the appropriation increased, enough for us to put four men in the field. They weren't satisfied, and said they wanted eight men at least. We told them we didn't have the funds and so they put up the rest of the money. The fruit growers themselves are paying approximately half of the cost. Two weeks ago we had a letter from California in which they made the proposition that if we would furnish them additional men to enlarge this service they would pay all the expenses. We don't like to do that because we want to keep the men on our payroll. It's a hard service for us to handle, because we must have trained men for it. In addition to being a meteorologist to start with he has to have special training and the fruit service lasts only about three or four months of the year. If we employ men three months of the year we must find something for them to do the other nine months. You ask how you can get it. My suggestion would be that you request the Secretary of Agriculture to include in his budget for next year an estimate to provide a fruit frost service for Florida, the same as they have in California.

Vice-President Poole: I know a letter has been directed to Mr. Marvin.

Mr. Kincer: That is alright and you might send one to the secretary also You know you need this service; you know it is being given in other parts of the country and my suggestion would be that you go to the secretary, tell him what you need and say that you would like to have him include in his next budget sufficient funds for this purpose.

Vice-President Poole: The Chair happens to know that steps have already been taken looking toward this type of service for Florida, but I believe a resolution would assist us in this move.

Motion made, Seconded and Carried that a resolution in favor of obtaining a forecasting fruit frost service for Florida be made, and that the executive officers of this Society be empowered to send in a proper resolution.

Cold Protection for Citrus Groves

Dr. A. F. Camp, Experiment Station, Gainesville, Fla.

Following the cold spells of the past winter Mr. DeBusk and the writer surveyed the citrus belt to study the effects of the cold and the factors involved in cold protection for groves. Some of the observations will be presented at this time and while much of it may be an old story to some of you there is plenty of evidence that the story needs to be repeated. This need for repetition of that which we are supposed to know may be echoed in one general statement concerning the results of our survey, namely: that a great many of our groves have been planted, especially in recent years, in situations in which there is little natural cold protection. This accounts for much of the damage done this year and emphasizes the remarks of one of the veterans of Florida citrus growing who, when asked concerning the relative hardiness of trees on the various rootstocks, said, "Sir, the hardiest rootstock is the one planted in the warmest place."

While I do not intend to go into a detailed meteorological discussion of cold waves at this time, I shall take the liberty of spending a little time on the fundamentals of frosty weather.

Two general types of "cold spells" may be designated. The first type is commonly designated as a radiation frost and usually occurs on still nights due to the rapid loss of heat from the earth to the upper atmosphere by radiation. This cools the earth which in turn cools the lower layers of air by conduction. This results in the formation of a layer of cold air next to the earth while it is warmer higher up in the air. This phenomenon is called "temperature inversion" and a very severe frost may take place under these circumstances. Under these conditions the upper and warmer layers of air tend to prevent the mixing of the atmosphere so that artificial heat is not lost so rapidly when it is applied and this sort of atmospheric structure is commonly spoken of as having a ceiling. This loss of heat by radiation goes on more rapidly when the atmosphere is dry, and is much more common in California than it is in Florida where the high humidity of the lower air layers tends to reduce the transparency of the air to radiation.

A second type of freeze is the so-called "blown in" type which is really a wave of cold air; this is the common type of freeze in Florida. In such a "blown in" freeze a large body of cold air is carried down over the state from the north by the migration of a high pressure area. These cold waves usually start in western Canada, though occasionally in the

southwest, and move southward toward Florida when the meteorological conditions are such as to draw them in this direction. As such waves hit the state they are usually accompanied by wind, especially in the earlier stages, and may last from one to three or four days depending upon the size of the area. As such a body of cold air moves southward it is gradually warmed by radiation from the warm soil. If the wave is a large one, however, the continual inrush of cold air nullifies the warming done by the soil and even the warming up during the day time is insufficient to stave off a freeze at night.

In considering frost protection we must try to evaluate the various factors which accompany what may be termed the average "cold wave." Some of the most important of these factors are as follows: Wind velocity, air flow, atmospheric structure, duration.

A still cold may be much more easily combatted by firing than one which is accompanied by wind, though where the cold is not very severe a wind may prevent the formation of frost. This applies to radiation frosts, however, rather than to "blown in" freezes. Most of our severe freezes being of the latter type are accompanied by wind though it frequently decreases considerably in the early morning hours when the temperatures reach their lowest. If the wind is high when the lowest temperatures are reached, artificial heating will be almost useless and even elevation is likely to be more or less ineffective since no opportunity is given for the off-flow of cold air. The following data from Mr. Bennett of the Weather Bureau at Tampa summarize the information along this line for some of our cold spells:

Date	Minimum	Wind at observation miles per hr.	Direction
Dec. 29, 1894	19°	6	N
Feb. 8, 1895	22°	8	
Feb. 14, 1899	22°	4	NW
Dec. 21, 1901	24°	3	N
Dec. 24, 1906	28°	10	N
Jan. 31, 1909	27°	27	N
Feb. 3, 1917	26°	29	NE
Dec. 31, 1927		8	N

Air-flow or air drainage refers to the tendency of air to react in much the same manner as water, i. e., the cold air being heavier flows to the lowest places. This comparison refers less to the flowing of water in air than to the action of water layers—no doubt many of you have gone into a quiet pool when swimming and found the surface layers much warmer than those beneath. The same principle holds in cold air distribution, the higher spots shed the cold air and frequently escape damage entirely in a still cold giving the spotted effect that frequently appears. During the past winter this condition was very marked, numerous groves having the lower parts of the trees badly injured while there was comparatively little injury to the top of the tree. This condition, however, indicated a condition of high radiation in addition to "blown in" cold.

The importance of the relative duration of a cold wave is easily explained

when it is remembered that stored up heat in the soil tends to warm the cold atmosphere. Since heat is given off by conduction whenever the air temperature drops below that of the soil it is obvious that the longer a cold spell lasts the colder the soil will be and the smaller the heating effect on the air. This is probably one of the factors in bringing our coldest temperatures on the second night of a cold wave when the stored up heat of the soil has been largely dissipated.

Summarizing the above, we may say that most of the severe cold waves which have struck Florida have been due to the influx of large quantities of cold air. That such waves are usually accompanied by considerable wind and that frequently they are of sufficient duration to cool the soil beyond the point where it will be useful as a protection.

With these things in mind let us consider some of the factors involved in grove protection in Florida without the use of artificial heating. In considering a location for a prospective grove, one of the most important factors is air drainage. For air drainage we need slope, elevation and somewhere for the cold air to drain to. We may have slope and elevation in a hole or valley without an outlet but under such conditions our air drainage would be effective only until the valley filled with cold air up to the level of the outlet. If the valley is large—say several miles in dimensions it may fill very slowly and groves are relatively safe at points below the outlet but in smaller valleys no grove is safe below the level of the outlet.

In large areas of flatwoods a very small elevation seems to be sufficient to insure protection against cold waves that are not too general in extent or which do not have too much wind. Under such circumstances it seems probable that the large areas involved permit an easy and unobstructed spreading of the cold air over a large surface so that it is not very deep at any one point. Under such circumstances small knolls might represent small islands in a very large sea of cold air, and the situation would seem not to be dissimilar from that which would occur if sufficient water were released upon such an area, as to cover it 5 to 10 feet deep in the lowest places. As soon as the cold air had a chance to settle a knoll with a comparatively small elevation would be above the colder layers of air and consequently protected. This was particularly noticeable in the edges of some of the flatwoods groves during the past winter. Observations in such areas are frequently misleading, due to the small differences in elevation which are effective in giving more or less protection. Throughout the flatwoods groves can be observed which are remnants of the '95 freeze and are apparently hale and hearty at the present time, and these lead to a mistaken feeling of confidence on the part of those planting groves in such localities.

Where the country is more rolling the situation is somewhat complicated, since the cold drains off the hills to collect in valleys from which it may be difficult for it to escape. A number of instances were observed in which citrus had been

planted in these small valleys with the result that in the cold spell of this year all the trees were killed or defoliated in such low places up to the level of the outlet, whereas, those trees above this level suffered no more than the damage of their fruit. The slides show such valleys. Even though a valley has a low outlet consideration must be given to the direction of the outflow, the width of the outlet as compared with the size and extent of the valley and the surrounding drainage slopes and to the areas into which the outflow must go. If an outlet faces to the north it is likely to tend to act in the nature of a funnel as long as the wind is coming from a northerly direction. Under such conditions there is a banking up of cold air within the valley, that produces a higher level of cold than would ordinarily occur. On the other hand valleys facing to the south might tend to drain more rapidly due to the pulling action of the wind. The examination of properties in hilly country should be made with an eye to the possible outlets for cold air, and the factors that may affect the efficiency of these outlets. Holes or valleys without outlets or areas of such a valley below the level of the outlet should be avoided unless provision is made for heating or unless there is water protection. In the case of open slopes a southerly exposure is to be preferred to a northerly exposure. The direct action of the wind strikes the northerly slope and tends to force the cold level higher than would be considered normal while the southerly slope, being caught in the eddy will frequently have a lower level. The southerly exposure likewise is subjected to a more direct action of the sun and a less direct action of the wind and consequently stores more heat during the day to offset cold at night.

Combined with the factor of air drainage is the question of water protection. From the theoretical standpoint the effectiveness of water protection will depend upon the size, depth, and temperature of the lake, combined with the amount and direction of slope to the lake. The effect of size which involves the distance which the air must travel across a water surface and the effect of the temperature of the water are both easily understood, while the effect of depth determines the amount of stored heat available to meet a protracted cold spell. Even small bodies of water may prove effective in giving some degree of cold protection as is noted in the two accompanying slides, one of which shows the effect of the hole in an orchard in which there was no water and the other a similar hole with a small pond probably less than an acre in extent at the bottom of it. It will be noted that in the first instance trees were severely injured at the bottom of the hole while those around the hole were very slightly injured; in the second instance the trees near the bottom of the hole were much less severely injured than those high on the sides. While such small bodies of water are not ordinarily to be considered as protection yet they may make it possible to plant holes in a grove that would otherwise have to be omitted.

On the larger lakes it is desirable to have property on the south side of the

lake, where the wind may only reach it after having traversed several miles of water surface. On the other hand, small lakes and ponds with steep shores usually afford more protection to the northern shore. A probable reason for this is shown by the following illustration. A strong current of cold air forced over the crest of a comparatively steep slope and dropping to the level of the lake would tend to create an eddy along the shore which both the water and the southerly exposed slope would tend to warm, the slow circular motion of the air being favorable to an efficient warming. On the other hand the main rush of cold air across the lake would breast solidly against the northerly slope and if the lake is small the amount of protection might be very small. In larger lakes the warming affected by the water may tend to force the cold layers upward as well as to warm it.

The value of good water protection is undoubtedly very great as all those who have groves on the south side of large lakes will be willing to testify, but at present we have not been able to translate this value into dollars and cents. Unfortunately so much of this property is now being sold for residence property that there is little room left for groves, and that which is left is held at such a figure as to seemingly preclude its use in this way. The same applies to coastal property especially on the East Coast.

Turning now to the trees themselves we will point out a few things that were found during the recent survey. Of the three types of citrus fruits grown extensively for the market in areas subject to freezes, tangerines, oranges, and grapefruit, the fruit of the tangerine suffers first from frost and suffers most severely. This is probably due to its small size and possibly to a low osmotic pressure of the juice, a point which needs to be determined. Oranges freeze more slowly than tangerines and more rapidly than grapefruit and the after effect is greater than it is in the latter. Freezing sufficient to produce considerable quantities of ice in the interior of the fruit causes drying out due to a disruption of the tissues. This may take place very rapidly in tangerines and much more slowly in the orange and grapefruit. In grapefruit this drying is very slow and unless the fruit is very severely frozen is hardly noticeable. In the orange and tangerine crystals make their appearance on the carpel walls and if the fruit is badly frozen are soon relatively conspicuous as small white specks on the walls of the segments. These will frequently identify frozen fruit even before it begins to dry out. In grapefruit the crystals can only be found with the greatest difficulty, if at all.

The trees themselves show much less variation in resistance to cold damage. The tangerine is probably the most cold resistant of the three with the round orange the least cold resistant when trees of equal ages and subject to the same treatment and location are considered. Seeemingly it would take years of research to show differences between varieties of oranges or grapefruit, if such a distinction could be made at all, though

this does not mean that cold resistant varieties might not be found later.

It is well known that the older the trees become the more resistant they are to cold and that old seedling groves are apparently much more resistant than the younger budded groves. There is the possibility that seedling trees are more resistant than budded or grafted trees of the same age but the lack of young seedling for comparison makes such a generalization dangerous. One very peculiar fact was noted that may have considerable significance. In one instance some very old trees had been cut back and moved one year prior to the freeze and after moving were budded. When the freeze came these trees had numbers of long and comparatively soft shoots from these buds which were only slightly injured whereas neighboring 6 or 7 year old budded trees were badly injured. In another grove seedling trees had been moved from another grove 5 years ago and heavily headed back thus forcing them to produce a totally new top. This block of seedlings adjoined a block of buds of practically the same age as the tops in the seedlings. In adjoining rows the buds were very severely injured while the 5 year old tops of the seedlings were practically uninjured. In this case the tops were of comparable age and the difference was in the rootstock, particularly with regard to age for we have no evidence that sweet stock produces a tree of greater cold resistance than rough lemon or sour orange. In neither case was there any factor such as slope or pocketing to explain the difference in the amount of killing. Both of these instances indicate that either there is much virtue in sweet orange seedlings or else the *age* of the *rootstock* is a vital factor and probably the latter.

Interest has been manifested in the comparative resistance of trees budded on various rootstocks, each man backing the rootstock of his choice. We can only say that we were unable to detect any material difference between the rough lemon and the sour orange under comparable conditions. While there might be some material difference if the question were gone into thoroughly enough the time and methods at hand failed to show any particular differences. This should be gone into more thoroughly in the future and a careful comparison made with sweet and other stocks.

Groves in good condition as to fertilization and cultivation withstood the freeze much better than those that were underfed or starved. It would appear from close examination that the idea commonly advanced that a grove can be starved to make it "hard" and consequently cold resistant is without adequate foundation. This does not mean that a grove should be over-fertilized for such procedure is likely to get the trees into a condition subject to severe injury due to an abnormal flush of growth or the presence of dieback. The strong normal grove is the one to have when cold waves come. This is reiterated in the observation that trees carrying a load of fruit suffered more severely than those in the same grove from which the fruit had been removed some time previous to the

freeze so that the trees had been able to recover their natural vigor. This is emphatically not an argument for shipment of more green fruit but it is wise in many cases to move the fruit from the least protected places first, other things being equal. This may react in two ways, it may cut down the amount of injury to trees in the less protected areas and it may also result in a saving of fruit if a freeze is not sufficiently severe to ruin the fruit in the higher or better protected places. This sounds like a, b, c but apparently there are quite a few growers that might study such portions of the citrus alphabet with profit. Some of these might be included in those that had trees frozen to the gound this year because they didn't bank. This will probably be enough on the subject of banking at the present time for most of you will probably bank your trees for the next 2 or 3 years. If we don't have another freeze, by then the subject ought to be taken up in detail about 3 years from now as a lot of you will have forgotten how to bank by that time.

High cover crops left on the ground are to be avoided since they hinder the movement of cold air and tend to hold it around the trees. At least one grove has been recently observed in which a crop of Crotalaria was standing during the recent cold with the result that the trees were killed up as high as the Crotalaria plants. How much damage may be done by cover crops of such low growing plants as Bermuda grass is unsettled at present and will require some careful temperature measurements to settle the question.

Let me now again reiterate the statement that I have had occasion to make so often in correspondence, "Look into the location of those groves that have been least damaged by frosts in the past and go thou and plant and cultivate likewise." You can learn more about cold conditions in your locality by studying the old groves than you could get from a 500-page bulletin.

ARTIFICIAL HEATING

We now come to the question of artificial heating of groves. Probably more of the discussion on this subject is occasioned by the fact that grove heating has been so decidedly successful in California than is occasioned by its performance in Florida. Let us examine rapidly some of the factors which vitally affect the performance of grove heating.

The most important factor in heating is probably air movement whether due to wind or to natural drainage. A still atmosphere prevents the heat from being swept away along the ground and also tends to slow up the loss of heat to the upper atmosphere. This later phase is more important than would appear at first glance, stirring both air and coffee increases the heat loss. Air movement is increased by good drainage and impeded by low locations, wind brakes, etc. Another factor is the presence or absence of the so-called ceiling which has already been mentioned.

As we know, most of the severe freezes in this state have been accompanied by more or less wind, especially in the early

stages, though a lull in which the wind is moving comparatively slowly often takes place at the time of minimum temperature. However, if this is combined with a location which gives excellent and unimpeded air drainage it is likely to be very difficult to hold the heat in the grove long enough to raise the temperature sufficiently to pay for the investment unless large numbers of heaters are used. On the other hand conditions which do not favor air drainage and which shut off the wind may materially improve conditions for firing. In a grove that is comparatively low and which is surrounded by high hammock growth they started firing coke heaters when the temperature reached 20° and were able to bring the temperature back up to 32° and to hold it there with a temperature outside the grove of 20° or below. The low temperature reached before firing was started was occasioned by the very rapid drop but was brought back up before damage was done. In this way the fruit, including tangerines, was saved. On the other hand a grove situated at the crest of a natural slope sufficient to keep the air in motion obtained only a 2 or 3 degree raise from heavy firing with the same type of heaters, though much more firing was done, than was done in the first instance. It would appear then that the factors favoring success with orchard heating would be those which hindered air movement, such as level land or low spots, interlacing canopied growth of the citrus trees and surrounding high wind breaks. A grove under such conditions might be fired very successfully unless the freeze was accompanied by a very severe wind. With such a grove and under ordinary conditions either oil or coke burners or wood fires might be highly successful if proper precautions in the way of accurate thermometers and alarms are provided and a careful check is kept so that the need for firing is not overlooked. In fact the use of carefully checked thermometers is nearly as important as the use of the heaters and unfortunately most of the thermometers that are commonly obtained may vary from 1 to 15 degrees at the lower ranges. All thermometers should be purchased from reliable companies and checked frequently. The use of recording thermometers is highly desirable as they give an indication of the rapidity of the drop and also a record of it for future reference. Under no circumstance should a bottle of alcoholic refreshment be substituted for the thermometer.

Unfortunately the factors which make for the greatest success with grove heaters are those which might increase the danger if heaters were not used so it is well for the prospective grove owner to weigh the possibilities carefully before proceeding. While it is possible to compromise between grove heating and natural protection to some degree yet it is doubtful if this will result in any gain in the end. For those who are planting large groves, however, and who do not wish to break up their planting by omitting the low spots these low spots might be protected by heating and under such circumstances heating may prove to be a very valuable adjunct to the problem of grove management.

R. J. Kepler, Jr.: I shall give my experience since 1917. I had no protection in the 65-acre grove that I owned in '17. I began to cut wood. I couldn't buy fire pots, and I protected over half of the 65-acre grove for about three years with wood, and then I installed fire pots over the entire grove. In addition, we acquired another 65-acre grove five miles north of Palatka. This is the farthest north of any large grove in the state. I had this grove totally covered with 3400 pots and wood on the back side of it. I fired four times this winter, when the temperature went to 20 degrees. Even though not more than a quarter of the heating capacity was utilized at any one time, the temperature was held absolutely above any danger point and we did not lose an orange from cold. They have gone into New York in the last month and will average me well above $3.00 net on the tree.

My grove at DeLand, which is protected, will net me around $1.75 to $2.00 average, since the freeze. There is no doubt in my mind about the value of firing to protect a grove even though the temperature will run down as low as 15 degrees and have plenty of fires left for the next night too. You don't need to burn them all if you have the fires well distributed, but I wouldn't recommend any man to fire any area without one pot to every tree. That's the only safe way.

There are a great many advantages in firing a grove in addition to the saving of the crop that is on the tree. You have the next year to look forward to. I think a man in DeLand, Mr. Nordman, proved to me that that is the biggest money that you will make from firing—the next year's crop, because when we have a disaster like '17 the man that has a crop the next year is the man who is going to make the money.

Mr. Stevens: I don't know as to the returns, but it was the best fired grove I ever saw. He fired every tree, and carried through the '17 frost in fine condition.

Mr. Kepler: Then there are two other items that come into it. We find we can regulate the time our fruit ripens and string it out a little more if you have that protection which gives you the confidence to change the system of fertilization. I believe it is possible to fertilize different, and produce our crop earlier in the fall. I don't know this. I am trying it out. I have irrigation in both of these groves that I speak about. Therefore, I have a better chance of controlling that period.

The grove in Palatka is under a flowing well; the one at DeLand under a pumping system. I have another 31½ acres north of DeLand. It had 5,000 boxes of fruit in the fall. I had only moved about 450 boxes of tangerines, when the freeze hit me and I lost the rest. I knew what firing would do, but I thought I could skin through, and it has cost me a lot of money. I will never own an acre of grove from now on that I cannot put fire pots in, and I tell you, gentlemen, while it's rather an expensive proposition, any business becomes expensive if you run it right, but you will make some money in the end, and I am certainly for the firing of groves.

Dr. Camp: As long as this question has been gone into in regard to firing, I would like to say that there are conditions under which firing can be done very successfully, and there are other conditions under which it would probably be very unsuccessful. There was a grove in Citra, and it was surrounded by heavy hammock in a rather low place. They saved the crop without the loss of an orange or tangerine during this winter's freeze by firing. They were able to start when it went to 20 and bring the temperature back up to 32 and hold it there. On the other hand, if you have rapidly moving air, your heat is likely to be carried away. If you are going into heating, by the proper use of wind-breaks, proper provision can be made for efficient heating, but when you try to compromise sometimes you may run into trouble.

There isn't much difference between the different kinds of heating, but you better provide yourselves with plenty of good thermometers. You fire too soon or too late. There were a couple of gentlement down here on the ridge who went out with a little refreshment in place of thermometers; one says "You know I feel warmer now," and the other fellow says "I know it's warming up," and they went home, and the oranges froze. This illustrates the point that they stress very strongly in California—have plenty of thermometers, and have them tested, and these tell you when to fire.

We are going a little more into detail of late in regard to heating, but it's a very complicated question in Florida, and I only wish we were in a position to do more research work on it, because we ought to have more real knowledge about the situation than we now have.

Member: Do you use charcoal or oil?

Mr. Kepler: I use both.

Member: Which do you find most satisfactory?

Mr. Kepler: There is nothing the matter with the coke heater but for your northwest side you have got to have something that will get to work in two or three minutes; a good oil pot will light quickly whereas coke heaters take about 30 minutes. The coke heater is a very good radiator; it radiates close to the ground. It's easy to handle, but not quick enough, and not quite strong enough.

Mr. Arndt: Some years the oil burns good; other years it will not burn good. In some spots the temperature went as low as 14° F. on Jan. 11. We raised that temperature with 500 Keller oil heaters to 30 degrees. Unfortunately the atmospheric conditions were such that the heaters commenced to suck. The temperature came down to 24° before we could get them started; we finally got it up to 28°, and pulled through without much loss. I am still putting in more wood.

Pres. Skinner: I met a government man from California this fall and had an interesting talk with him about cold damage. He made some very interesting statements. He said that water sometimes reached a temperature of 25° or 24° without forming ice. If you touched

the water, however, or jar it, or did anything to disturb it, the whole thing would immediately turn to ice. That was a revelation to me. They stated an orange would stand 24° without forming ice, but if you touched it, it would be filled with ice in a few moments. I couldn't tell you the reason except they said the crystalization would not start off well until something started it.

I saw how one man protected his grove. He couldn't get heaters; he couldn't get wood in time, but he took a lot of fertilizer sacks, filled them half full of sawdust, and poured oil on them, and fired them, and covered his grove with smoke. I think that might be very efficient under certain circumstances if the cold was not too severe, and if the smoke could stay there.

Dr. Camp: Smoke is not considered a benefit from the heaters, and the better heaters are practically smokeless.

Mr. Skinner: Doesn't some of the damage to fruit lie in the thawing out of the orange too rapidly in the morning?

Dr. Camp: Very much so.

Mr. Skinner: Wouldn't that smoke be a protection?

Dr. Camp: If the air were still enough to hold it over the grove.

Mr. Skinner: That depends on the locality too?

Dr. Camp: Yes. Fruit thawed very slowly is hurt less. Trees that are in the shade thaw out much more slowly.

Mr. Richard Compton: This gentleman said he put one pot to each tree. I would like to ask how close to the trunk he put it.

Mr. Kepler: I place my pots northwest from the tree so that the wind coming from the northwest, which is the usual direction, carries the heat into the tree. You place them just as close as you can without burning. They come out much better after they are burned than when they are frozen. I place them right close. That's one advantage of the coke heater. You can set it underneath the tree.

Mr. Skinner: You speak about having a reserve of pots. Do you have more than one pot in your grove to a tree?

Mr. Kepler: Yes.

Mr. Compton: How many pots to the tree?

Mr. Kepler: Two to a tree in the first four rows, on the northwest side of the grove. In the Palatka grove on the northwest side the pots are set on a nine-foot center in the first five rows. The wind comes in so very cold, even with the river present, that this spacing is necessary to warm the air before it spreads over the entire grove. When I begin firing, I light two rows solid on that side and the rest when the temperature indicates this is necessary.

Icicles and Sunshine

M. R. Ensign, Agricultural Experiment Station, Gainesville

The agricultural prosperity of Florida, depends largely upon the production of "out of season" truck and of semi-tropical fruits. There are numerous problems to be met in such a program. There are soil management, varietal adaptations, plant diseases and insect pests, to say nothing of packs and packages and the eternal marketing tangle, all of which present a maze of barriers to the grower. Yet with all of these there is yet another, which is even more disconcerting and which in terms of actual losses sustained far over-shadows them all. It is that occasional hoary visitor called "Jack Frost" who oftimes carries with him a huge supply of weapons in the form of icicles. In Florida he is an unwelcome guest, coming as he does like a thief in the night and laying waste hundreds of thousands of dollars of valuables in the nature of tender crops and semi-tropical trees, shrubs and ornamentals. And no man knows when he is coming nor how vengeful his mood may be.

IF HISTORY REPEATS ITSELF

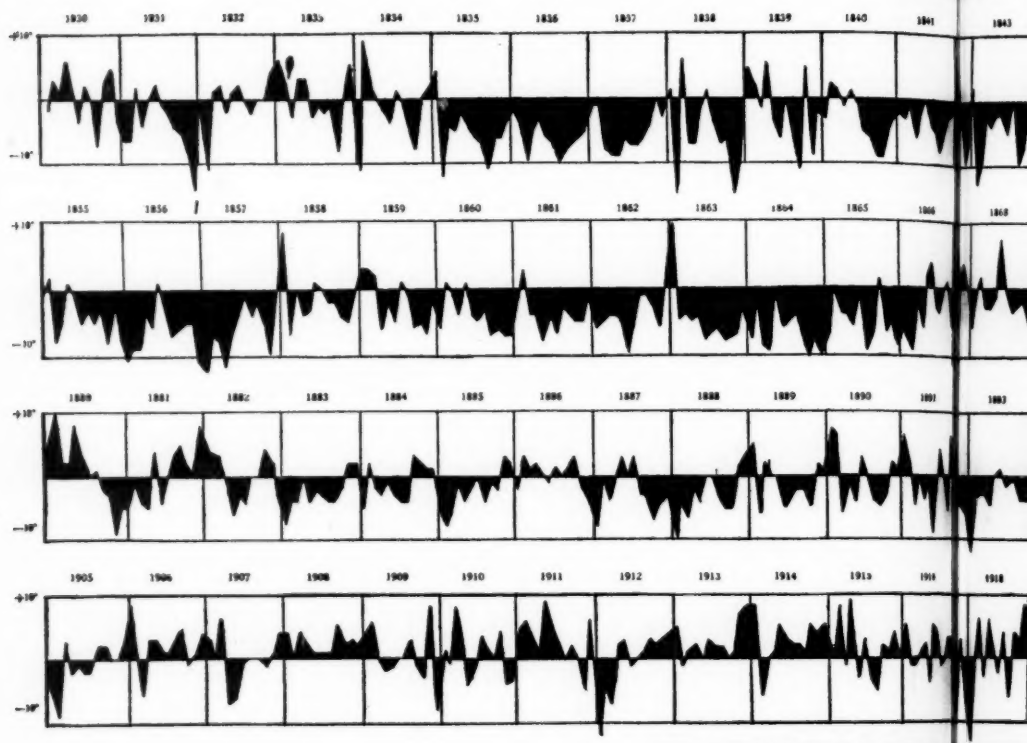
At some points in this state official weather records have been kept for three score years. There are quite a number of places that have records 35 years old, and with the settlement of the interior many valuable data are now in the process of collection, but which at the present time are not sufficiently numerous to warrant the drawing of conclusion of a reliable nature.

But with the records such as we have for Bradenton, for example, covering a period of 35 years there are some interesting observations that may be helpful in our efforts to ward off disaster from the occasional cold snap which creeps upon us, and these are valuable only in so far as history may repeat itself.

WHERE DO FROSTS OCCUR AND HOW FREQUENTLY

No astute business man, or one having just ordinary common sense would disregard fire and flood hazards in the establishment of a factory, yet if the majority of truck or fruit growers in Florida pay any heed to the history of cold waves in Florida as to the time of their occurrence, duration and frequency, there is mighty little evidence of it. Truck crops are quickly made and more quickly lost, as we were reminded twice this winter. In order to get our produce upon the lat-

PLATE V



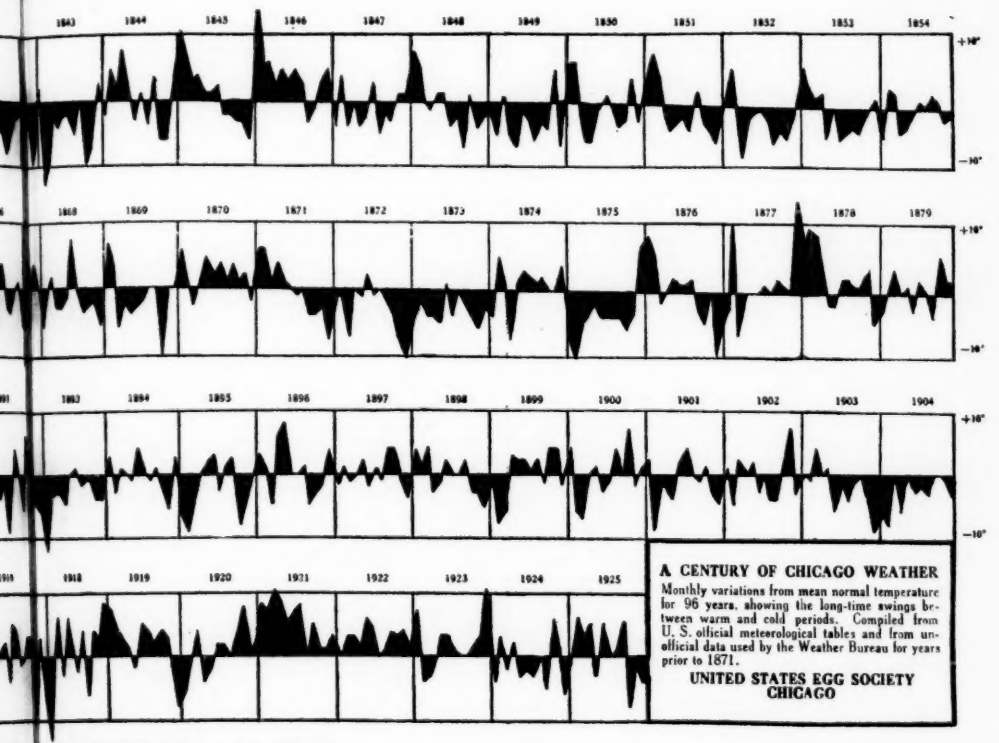
GRAPHIC CHART OF CHICAGO WEATHER OVER

est fall markets or on the earliest spring market there is a tendency to risk everything. This is a simple case of gambling with cold weather and ought to prove a fertile field for some aspiring politician.

By selecting some thirty widely scattered points in the state where weather records have been kept for 30 to 80 years the Graph here shown was constructed. *Plate I.* It shows the average annual cold expectation for each of the points considered. With the information that this supplies, it would not be difficult to decide whether it would pay one to plant cabbage or tomatoes at any given place during the winter months.

The map reproduced here (Map of 1917 freeze), *Plate II*, quickly answers the question as to where frosts occur. This map represents very closely, the isotherms of each of the cold waves from 1870 to 1927, of which there have been six. These periods of cold are worthy of some study aside from their origin or

PLATE V


1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854
+10°
−10°
1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879
+10°
−10°
1883 1884 1885 1896 1897 1898 1899 1900 1901 1902 1903 1904
+10°
−10°
1918 1919 1920 1921 1922 1923 1924 1925
A CENTURY OF CHICAGO WEATHER
Monthly variations from mean normal temperature for 96 years, showing the long-time swings between warm and cold periods. Compiled from U. S. official meteorological tables and from unofficial data used by the Weather Bureau for years prior to 1871.
UNITED STATES EGG SOCIETY
CHICAGO

AGO ER OVER PERIOD OF 100 YEARS

their influence upon the agricultural development of this state. It is pertinent to inquire if there are any indications here that history repeats itself!

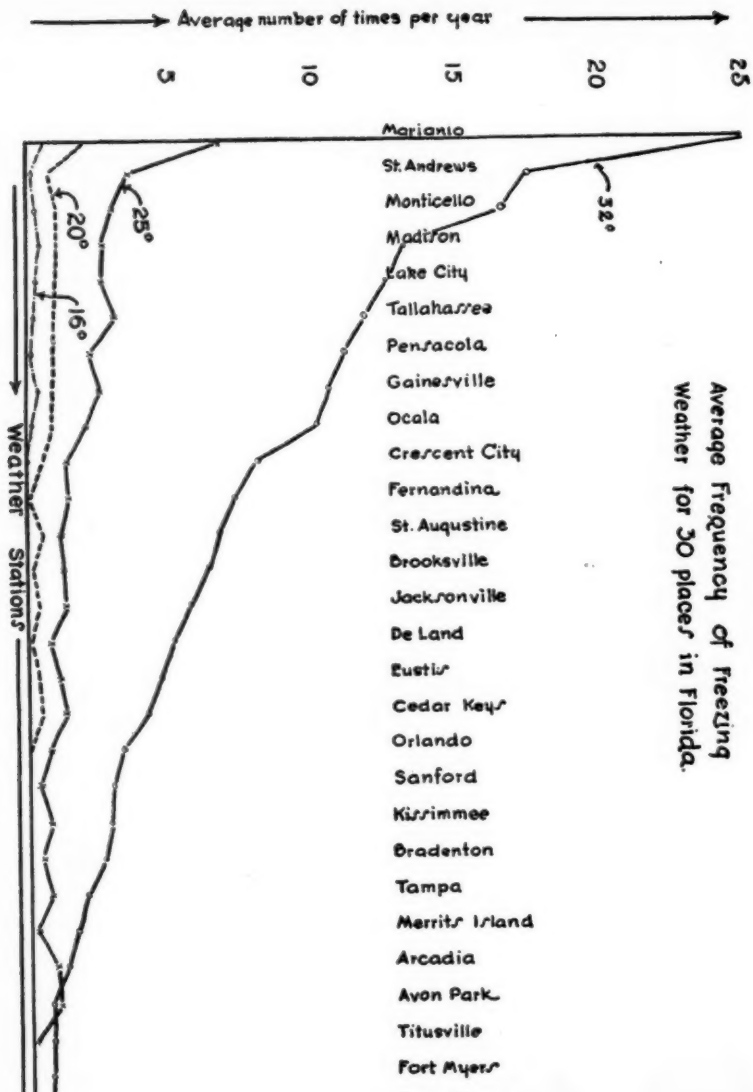
SOME KNOWN CYCLES

At the last meeting of the American Association for the Advancement of Science in Philadelphia a paper was presented by a Russian scientist that purported to show that with the recurrence of certain solar phenomena known as sun spots human behavior was directly affected. Events such as the battles of Troy, Thebes, Salamis, the Crusades from the eleventh to the thirteenth centuries, the discovery of America in 1492, and the events of 1870 were cited as evidence to show how the sun spots have really influenced human destiny. It may be that today even the latent Chinese are feeling the effects of our approaching sun spot maximum.

By sun spot maxima is meant that time when the cyclonic storms in the so-

PLATE I

Average Frequency of Freezing Weather for 30 places in Florida.



lar atmosphere are most frequent and intense.

In addition to the influence of sunspots upon humans directly, there has recently been definitely established a marked influence of these solar storms upon radio reception. There is also thought to be some possible connection between earthquakes and sun-spots. It is a fact that at times of sun-spots maxima there is an increased supply of the ultra-violet rays, and doctors are agreed that there should be less rickets during these periods, and a good case of sunburn should not be difficult to acquire.

From an exhaustive study of the time of the grape harvest in Western Europe together with other phenological data a German by the name of Brückner concluded that a period or cycle of 34 years regularly recurred.

SOME KNOWN CYCLES

In this country, Dr. Douglass has studied the sequoias of California with a view of determining whether any well defined periods or cycles existed. He has shown a very decided correlation (85%) between tree growth as measured by the annual rings and the 11.7 year sunspot cycle. It is evident that 11.7 when multiplied by three gives us the Brückner period. Is this significant?

The flow of the Nile River together with the Lake levels show a relationship between sunspot activity and precipitation. These weather changes are responsible for the change of time of the grape harvest and tree growth as noted above. From such data the following periods or cycles have been established and are more or less well defined for certain areas; 26 months, 3, 5½, 7, 11.7, 22, 34, and 101 years.

The graph shown, *Plate III*, indicates some of the relationships that have been worked out. Note the lag between the maximum sunspot activity and the lake levels. This is what we should expect, however.

Applying now these data to our cold waves, let us see if there is any indication that the sunspot activity is responsible. For a number of reasons some of which I am sure are obvious, the temperature records for Bradenton have been taken as a basis of comparison. *Plate IV*.

The year from 1892 to 1899 was a period of unusual cold in Florida and is the only place on record where the cold continued through a decline of sunspot activity. Note, too, the tendency for the peak of the cold to lag behind the sunspot maximum. This is probably due to the cold accumulation in ice-caps, ocean temperatures, etc.

The heavy line at the top of the graph indicates the total accumulation of cold in degrees Fahrenheit below 32 degrees for each year. It will be seen that the correlation is not so marked as with the lowest temperatures for the same years. Note that the cold accumulation was as great in 1908-09 as in 1917, yet by far the lowest temperatures came in 1917. In this connection it is important to note that with the exception of the cold in December, 1894, and 1906, the month of February has been notorious for its icicles. This fact may not be generally

PLATE II

MAP OF 1917 FREEZE

recognized since the mean temperatures for February are higher than those of December or January. It is the occasional extreme cold that comes in February that is of significance here. This fact alone should be of much value to truck growers who will plant at such times as to avoid too great risk.

The data which is presented here in a graphical form is of interest mostly because it may give some clue as to what may be expected in the future. Astronomers and meteorologists seem to be pretty generally agreed that we may expect no very radical departure in climatic conditions from those that have prevailed for the past several thousand years, at least. Here is a graphical representation of the Chicago weather over a period of 100 years. *Plate V.* Aside from the fact that there are rather well defined cycles of abnormal cold followed by abnormal heat indicated over a period of years, there is nothing to show that our weather has changed materially in that time.

The thing that engages our greatest curiosity and speculative interest is what kind of weather may we expect with the present approaching sunspot maximum. We are told that the spots are very plentiful and that we may expect the maximum either next year or in the early part of 1929. With the two cold snaps that we have already experienced even before the sunspots have attained their maximum and recalling also that heretofore our coldest weather has always followed such maxima it is most intriguing to wonder what 1929 and 1930 may bring. And going one step further, we must not fail to be concerned about this sunspot maximum since it is also the peak of the 35-year cycle as well as that of the 60-year period dating back to the cold of 1870. The 35-year cycle is apparently accompanied by greater deviations of temperature and precipitation from the normal than those of the shorter cycle.

LONG PERIOD WEATHER FORECASTING

Many will recall that certain weather "prophets" staked their possible reputations upon the prediction that this past winter would be the coldest in a century. So far as records show their reputations have become deceased. Had they made the modest statement that with the approaching sunspot maximum, weather extremes and rather wide variations from the normal might be expected, not only would the reputation of a few men have been saved but the entire populace of the country would now have greater faith in the utterances of those who are qualified to speak on this delicate but important weather question.

Every one recognizes that our sole source of energy and heat comes from the sun. Consequently anything in the way of sunspots or other photospheric disturbances that obstruct direct radiation from the sun is bound to affect us and our weather. Pursuing this idea, Dr. Abbot of the Smithsonian Institute, together with Mr. H. H. Clayton, an eminent meteorologist, attempted to forecast the weather for a week in advance based upon the variation of the solar radiation as taken daily from two widely

PLATE III

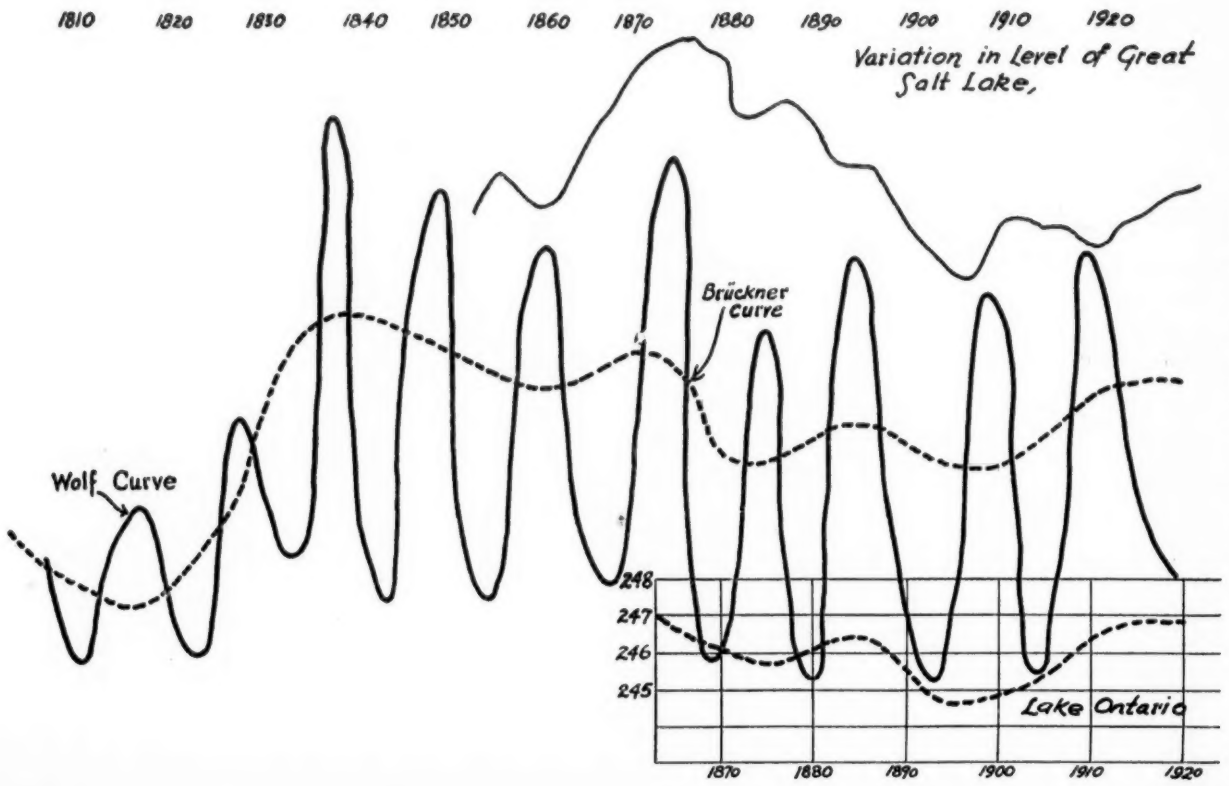

1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920
Variation in Level of Great Salt Lake,
Brückner Curve
Wolf Curve
248
247
246
245
Lake Ontario
1870
1880
1890
1900
1910
1920

PLATE IV

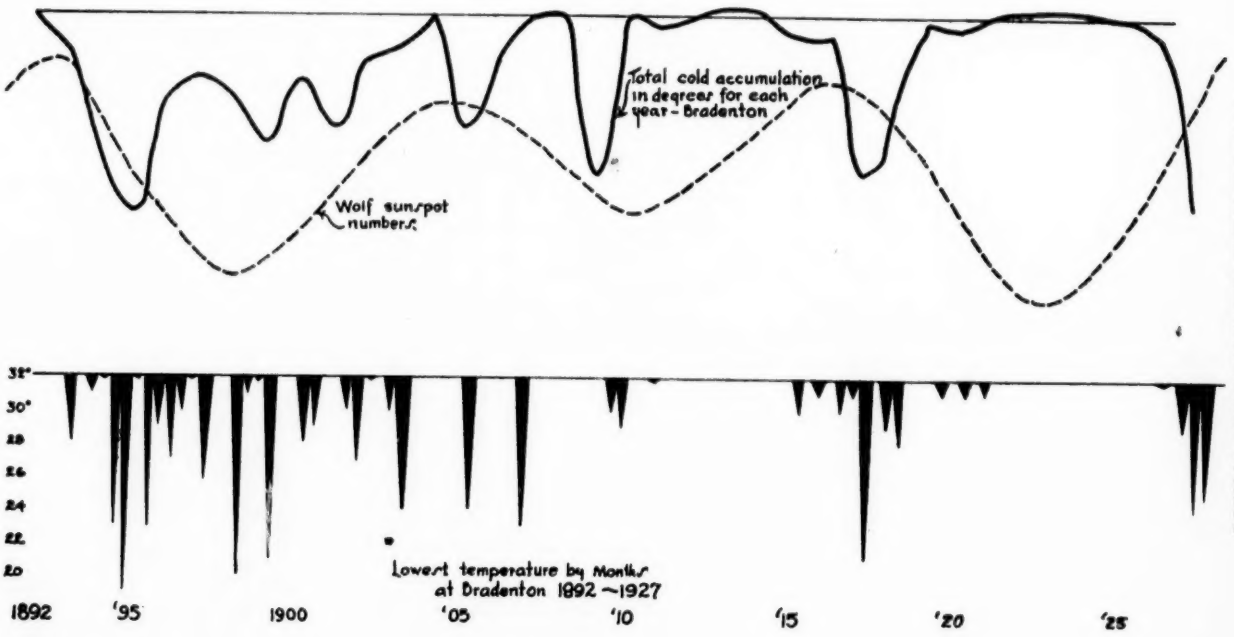
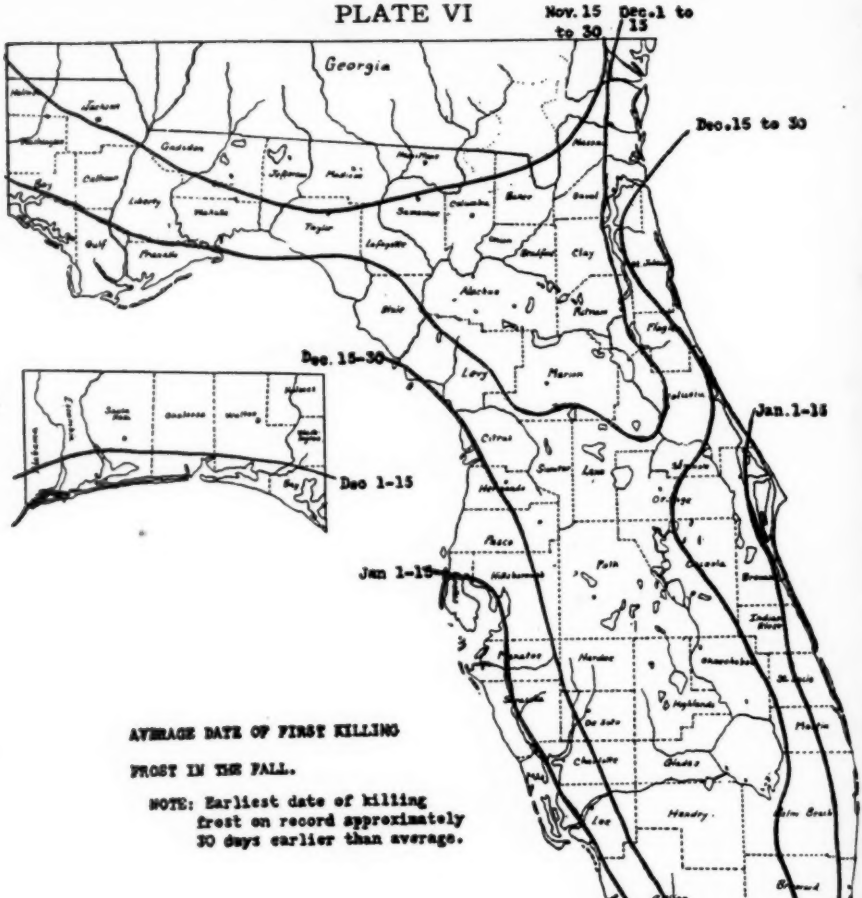

Total cold accumulation in degrees for each year - Bradenton
Wolf sunspot numbers
32°
30°
28
26
24
22
20
Lowest temperature by Months at Bradenton 1892 – 1927
1892
'95
1900
'05
'10
'15
'20
'25

PLATE VI



AVERAGE DATE OF FIRST KILLING FROST IN THE FALL.

NOTE: Earliest date of killing frost on record approximately 30 days earlier than average.

separated observatories. The methods employed and the principles involved is a story in itself. Suffice it to say that they claim to have successfully forecasted temperatures and precipitation for the Buenos Aires section over a period of two and a half years.

Charles F. Marvin, Chief of the U. S. Weather Bureau, and others discount the work of Abbot and Clayton heavily upon the ground that the variation in solar radiation is too small and not accurately enough measured to account for the daily weather changes. Also there are too many disturbing factors of terrestrial origin to permit of generalizations along this line. It remains for us to comment that should such long time forecasting be perfected the benefits now derived from the present 48-hour service would be immeasurably increased.

FROM SPECULATIVE FANCY TO COLD FACTS

Is there no information that may be gleaned from the weather bureau records that is concrete enough in nature to be of immediate use to the truck growers of Florida in their feeble efforts to combat cold?

Here are maps indicating in a general way the average dates of the first killing frost in the fall, *Plate VI*, and the last killing frost of the spring, *Plate VII*, for various point in the state. There are a number of interesting facts indicated. The influence of the ocean and gulf in tempering temperatures is well shown. The direction which the isotherms point in the fall is distinctly along the peninsula since the prevailing wind is from the northwest. With the cold snaps of spring the lines shift to the southwest for then the prevailing winds are from the northeast. This gives the lower East Coast a good deal greater protection in the early spring months than in the first cold snaps of the fall. (Date of the first and last frost 30 days from average.)

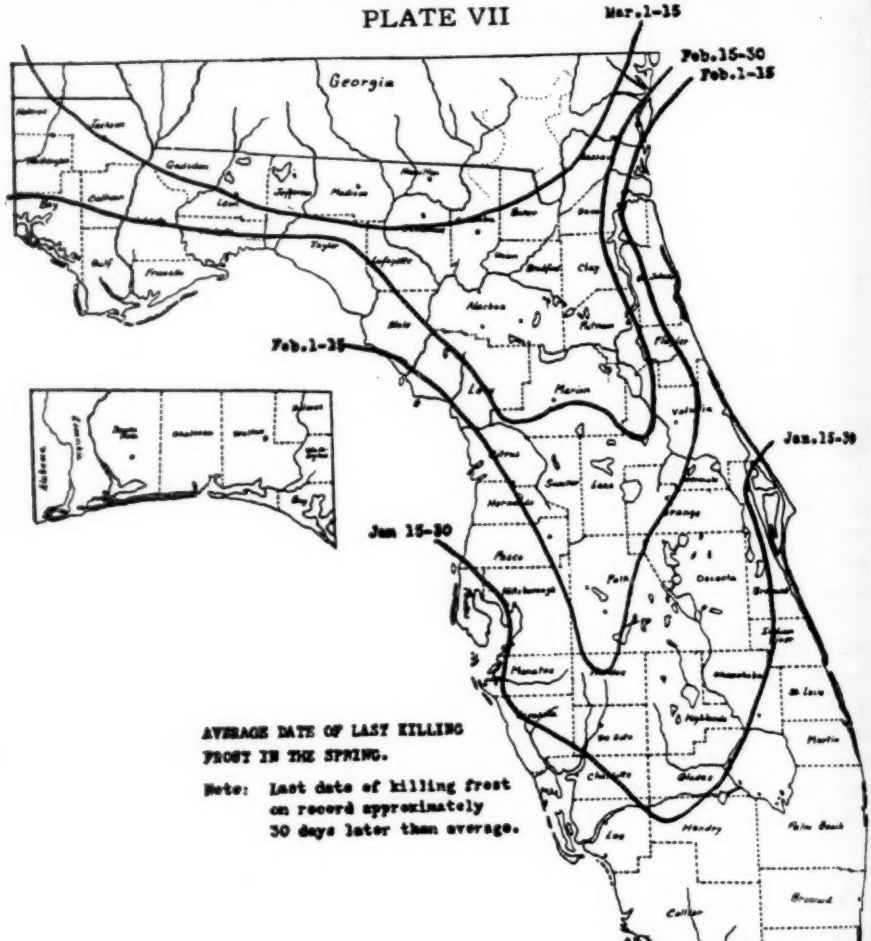
Now by taking the data regarding the average date of the first killing frost in the fall and the last in the spring, it should not be difficult to so plan the planting of hardy and tender vegetables that all the eggs are not put into the gambler's basket. Here is an attempt to indicate diagramatically a comparatively safe system of cropping tender vegetables which can be adapted to any place where frost data is available over a period of years. *Plates VIII* and *IX*.

COLD PROTECTORS

For the past two or three years there have been numerous trials made with different kinds of plant protectors. These trials have been in the north and east as well as in California, and with such crops as tomatoes, cucumbers, cantaloupes, and watermelons. Reports indicate varying success. These protectors were made from waxed paper of various kinds and shapes and in a few instances celloglass was tried. One man has made a small hot-house of celloglass which may be dissembled for storing and this has given very good results. It is impractical, however, on account of the excessive cost.

There were certain difficulties encountered in practically all the trials. There

PLATE VII



AVERAGE DATE OF LAST KILLING FROST IN THE SPRING.

Note: Last date of killing frost on record approximately 30 days later than average.

was the question of anchorage against wind, the ventilation problem, and the freezing of that portion of the plant that happened to be in contact with the protector. Certain individuals had better success with the same type of protectors on the same kind of crops than others under apparently the same conditions. Hence there is much to be done of an experimental nature before any recommendations may be made for the use of protectors in Florida. But it is not too much to hope that a type of plant protector suitable for certain hill crops, at least, may be worked out which will prove helpful.

It probably indicates poor judgment to exhibit this map last, *Plate X*, for it may cause a gloom to settle over our minds. The facts shown herein are not pleasant ones to contemplate, but there is this to be said in favor of them. They are cold *facts* and not hyperboles or mere flights of the imagination. What has happened may happen again, and in the building of a permanent agriculture for the State of Florida, it is well to have all the facts which may influence such permanency.

SUMMARY

We may briefly summarize the data here presented as follows:

1. There are cycles or periods of varying length, some or all of which are directly connected with sunspots and other solar phenomena.

2. Cold waves in Florida are directly connected with such cycles. We do have killing frosts at other times than sunspots maxima but there has never been a sunspot maxima since 1835 without abnormally cold weather attending it. Apparently the crop insurance agencies are cognizant of these facts.

3. From the weather records of any station it is possible to plan a cropping system with hardy and tender vegetables which will reduce to the minimum the heavy losses now sustained.

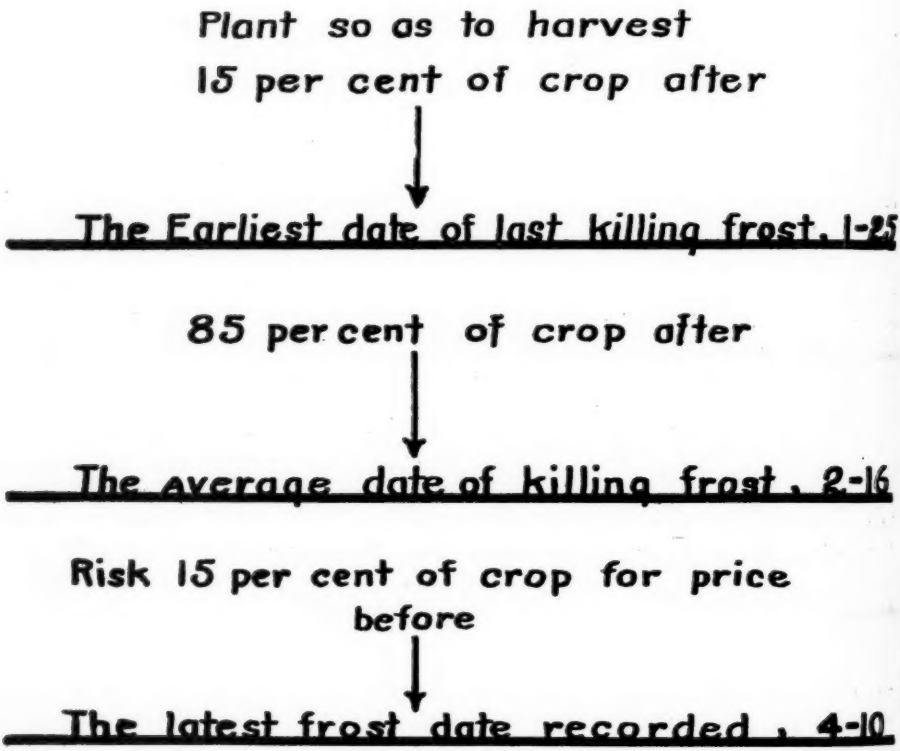
4. The practical use of plant protectors for tender truck during cold weather has great potential possibilities. These are directly dependent upon the adequacy with which funds are made available for the scientific study of this problem in Florida.

Mr. L. B. Skinner: Perhaps some of you older members of the Society will remember the first paper that we had upon "Sunspots and Cold in Florida" some years ago. Mr. Watson made the report, and I remember it made a great impression, and I expected cold in 1927 and 1928, and I haven't been disappointed so far. I hope I won't be after this.

Mr. Yothers: The Scripps Foundation in California predicted the rainfall of the State of California, successfully ten years out of eleven. The tenth year the same amount of water fell, but it fell in the northern part of the state instead of the southern part. They measure the temperature of the ocean currents, and by mathematical formula they figure out the rainfall from these data. I have been trying to get the ocean temperatures made

PLATE VIII

A Suggestive Cropping Plan For Spring Crops


Plant so as to harvest
15 per cent of crop after
The Earliest date of last killing frost, 1-25
85 per cent of crop after
The average date of killing frost, 2-16
Risk 15 per cent of crop for price before
The latest frost date recorded, 4-10

Note: dates are for Jacksonville.

PLATE IX

A Succestive Cropping Plan For Fall Crops.

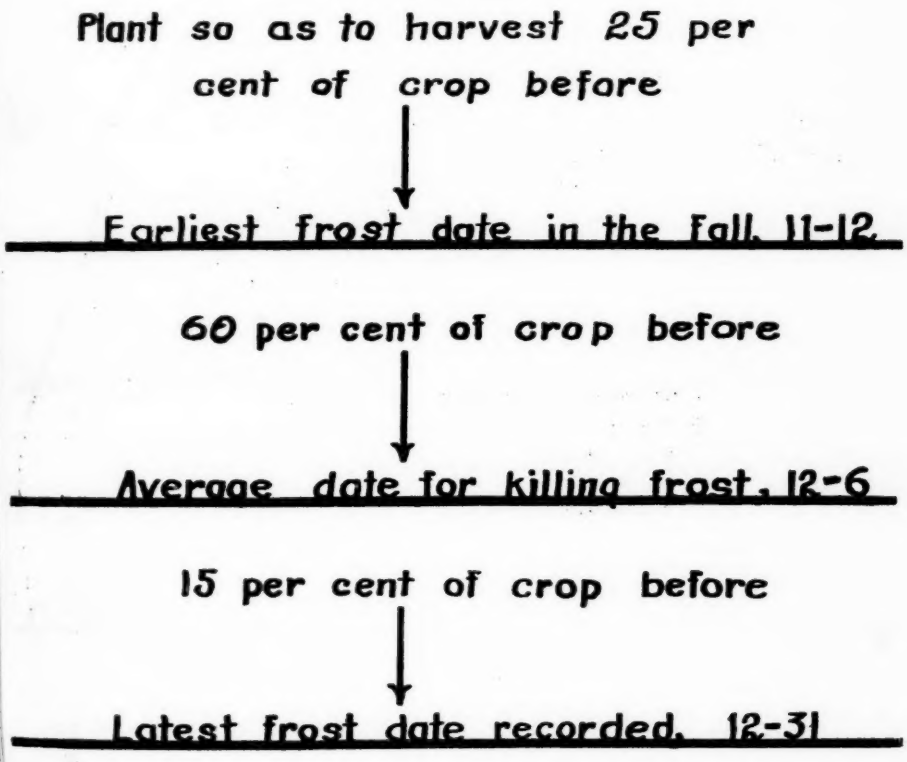
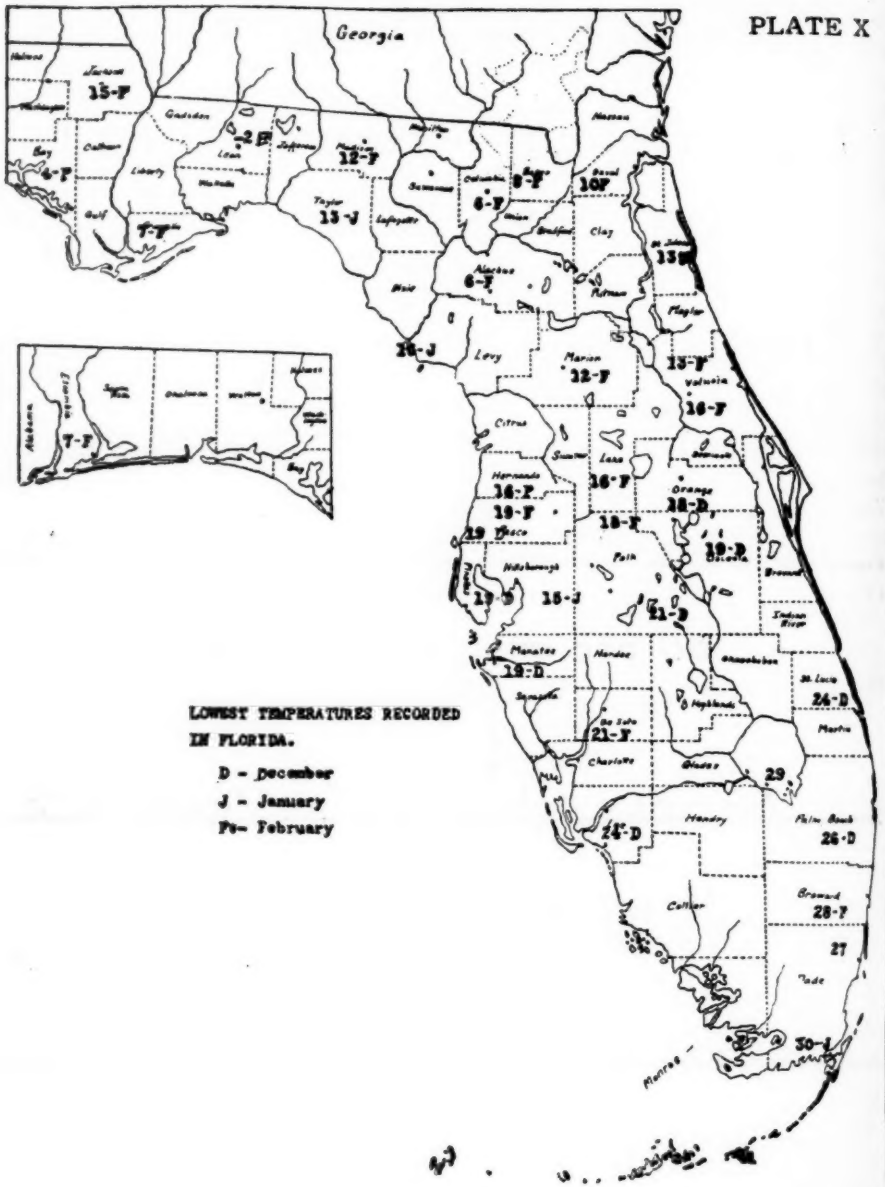

Plant so as to harvest 25 per cent of crop before
Earliest frost date in the Fall, 11-12
60 per cent of crop before
Average date for killing frost, 12-6
15 per cent of crop before
Latest frost date recorded, 12-31

PLATE X


Georgia
15-F
-2 F
12-F
4-F
7-F
13-J
8-F
6-F
10F
6-F
13F
10-J
32-F
15-F
16-F
7-F
16-F
16-F
18-F
19-F
29
18-F
19-D
19-D
16-J
21-D
19-D
24-D
21-F
29
24-D
26-D
28-F
27
30-J
LOWEST TEMPERATURES RECORDED
IN FLORIDA.
D - December
J - January
Fe- February

out in the Gulf and out in the Atlantic. At the present time they have been taking some of these temperatures but the data is not sufficient to warrant the making of predictions. I have often thought that the Society should demand more work along this line.

There is another bit of information I would like to offer, which to me is startling. Some years ago I received the February issue of the Journal of the American Meteorological Society. Professor Brooks of Clark University published in this number that Florida would have an unusually wet May, and that was the month of May that I think the Weather Bureau records show was the wettest May we have ever had. I am not prepared to say how this Professor figured it out. It is beyond me, but I know it is a fact.

Pres. Skinner: Was this last year?

Mr. Yothers: No, three or four years ago.

Pres. Skinner: I would like to know whether we are going to have it in May this year, too.

Mr. Lord: I think the paper has been exceptionally valuable, and especially in connection with Prof. Watson's paper of several years ago. I would like to call attention to the fact that we are not only going to reach the high spots mentioned by Prof. Ensign, but we are also going to reach the high spot of the hundred-year cycle. All three are coming. Furthermore, I would like to call your attention to the fact that not only in the sunspot maximum do you get a greater variation where it's cold, but you get an increase in rainfall, so following the maximum for several years you may expect more rainfall than usual in Florida, and perhaps a better distribution.

Pres. Skinner: You don't happen to know whether we get the 4,000 year period, too, do you? Boys, get ready.

ANNUAL REPORTS

REPORT OF SECRETARY

Up to April 13, 1927

Receipts		Expenditures	
Brought Forward from 1926	$ 225.56	13 Invoices totaling	$ 446.58
Seven Life Memberships	175.00	Returned Checks	6.00
Four Fla. Rose Society Memberships	12.00	To Florida Rose Society	9.00
Eleven Perennial Memberships	110.00	Trade Acceptance Completing payment for Printing 1925 Proceedings	390.75
Annual Memberships, 1927	186.00	Payments on Printing of 1926 Proceedings*	970.00
Annual Memberships, 1926	1,356.00	Cash on Hand	364.23
Sale of back reports	117.00		
Contribution	5.00		
	$2,186.56		$2,186.56

Debits*		Credits*	
Printing 1926 Proceedings	$ 2,064.05	Check from Horticultural Society	$ 70.00
Interest on Trade Acceptance	13.33	Checks from B. F. Floyd, Personal	120.71
Interest on Trade Acceptance	13.33	Check from Horticultural Society	900.00
		Trade Acceptance Sept. 23, 1926	1,000.00
	$2,090.71		$2,090.71

BAYARD F. FLOYD,
Secretary.

*Account of Horticultural Society with E. O. Painter Printing Company, DeLand, Fla.

REPORT OF TREASURER

Up to April 14, 1927

Cash—		Stocks—	
On Deposit in Savings Account	$246.71	Florida West India Corp—	
Bonds—		Twenty Shares, Preferred, par each—$100.00	$2,000.00
Patron Membership, Liberty Bonds	$3,650.00	Ten shares, Common, par each—$100.00	$1,000.00

N. A. REASONER,
Treasurer.

REPORT OF AUDITING COMMITTEE

We, the undersigned members of your Auditing Committee, beg leave to report that we have examined the books and vouchers of the Secretary and find them to be correct; that we have examined the statement of securities of the Treasurer and find them to be correct; and further report that the present Treasurer states that no books have yet been turned over to him by the former Treasurer.

Bradenton, Fla., April 14, 1927.

E. F. DeBusk,
Wm. A. Sessoms.

REPORT OF EXECUTIVE COMMITTEE

Meeting of May 6, 1926

A meeting of the Executive Committee was held in the auditorium of the new Indian River Hotel, Rockledge, at 4:00 p. m. on May 6, 1926. The following members were present: L. B. Skinner, B. F. Floyd, with B. L. Hamner and Frank Sterling represented by proxies. Others present were W. W. Yothers, E. F. DeBusk, W. E. Sexton and N. A. Reasoner.

After the call to order and reading of minutes of last meeting, the following business was transacted. It was voted unanimously:

(1) To authorize the secretary to print a number of the 1926 Proceedings, 100 in excess of the actual membership at time of going to press;

(2) That the president appoint E. F. DeBusk librarian of the Society and that as librarian he shall have charge of all copies of the Proceedings not distributed to the membership;

(3) That the secretary be authorized to accept librarys as life members.

There being no further business for consideration, the committee adjourned.

Meeting of February 8, 1927

The regular spring meeting of the Executive Committee of the Florida State Horticultural Society met at the call of the Chairman in the Hillsboro Hotel, Tampa, on February 8th, 1927. There were present Messrs. L. B. Skinner, Bayard F. Floyd, N. A. Reasoner, M. R. Ensign, E. L. Lord and S. F. Poole, with Wilmon Newell, Dr. J. H. Montgomery, C. C. Commander, John H. Taylor, E. L. Wartmann and Gen. A. H. Blanding as visitors.

April 12, 13, 14, and 15 were selected as the time for the Fortieth Meeting of the Society.

The Manatee River Bank and Trust Company, Bradenton, was selected as the depository of the treasury funds, and to continue as such until revoked. The Dixie Grande Hotel at Bradenton was

selected as headquarters for the Society during the meeting.

Various phases of the program for the meeting were discussed in detail and the Secretary was instructed to proceed with the completion of it. It was decided if feasible to devote one session to the discussion of vegetables.

The Secretary was instructed to cooperate with the Florida Rose Society and local organizations at Bradenton in holding the Second Annual State Rose Show.

The proposed new Plant Act was presented by Dr. Wilman Newell. It was read and discussed in detail and several constructive criticisms were made after which, it was unanimously endorsed by the committee.

There being no further business the meeting adjourned.

SELECTION OF MEETING PLACE FOR 1928

Invitations were extended from Winter Haven, Lake Wales and Clearwater. Winter Haven was unanimously selected as the meeting place for the 1928 meeting. Lake Wales withdrew in favor of Winter Haven.

Resolutions

NEW PLANT ACT

Moved, Seconded and Carried that this Society endorses the new Plant Act as drawn by the State Plant Board, and urges its passage by the Legislature, and that the Legislative committee of the Society take this matter up and carry it through to a finish.

STATE INSTITUTIONS

Whereas, the population of Florida is rapidly increasing and the number of our young men and young women seeking education in our higher institutions of learning is also increasing, and

Whereas, the facilities of the University of Florida at Gainesville and the State College for Women at Tallahassee are and have been for a number of years inadequate to properly take care of these greatly increasing number of students, and

Whereas, the agricultural and horticultural interests of this State are vitally concerned about the unsolved agricultural and horticultural problems that confront them, many of which problems can only be solved by accurate experiments covering many years carried on by trained experts; and,

Whereas, much of this work has been accomplished, is in process of being accomplished, or planned and not yet at-

tempted by the investigation in the University of Florida Experimental Stations; and,

Whereas, it is essential that this work should continue unimpaired for want of funds and it is reported that more funds are greatly needed for this purpose, and

Whereas, Dr. A. A. Murphree, president of the University of Florida and Dr. Conradd, president of the Florida State College for Women have made recommendations to the Legislature of the State for certain appropriations to carry on the work of those institutions; and the Board of Control has also submitted a minimum budget as absolutely essential to carry on the work of these institutions unimpaired, and

Whereas, it is now reported by the press that a resolution seeking to empower the Speaker of the House to name committees for investigating conditions at the University of Florida and the State College for Women with the view of making financial recommendations failed to pass the House, and there seems great danger that these institutions may not be sufficiently financed for the next biennial period.

Therefore, Be It Resolved by the Florida State Horticultural Society in session at Bradenton, Florida, on this 14th day of April, 1927, that while its members do not assume to say just what financial support these institutions of learning should receive, they are convinced that a more liberal policy than that which has prevailed in the past should be inaugurated for the future, and they view with grave concern any tendency on the part of the Legislature of the State to act without adequate information or until after the most careful consideration.

Be It Further Resolved that while this Society is in favor of economy of administration and of the reduction of taxes, where it can reasonably be done, it is not in favor of impairing the efficiency of our State Institutions of Learning and thereby the future progress of our state, by any policy of retrenchment however praiseworthy that policy in itself, may be.

The adoption of the foregoing resolution was moved, seconded and unanimously carried.

April 14, 1927.

Final Resolutions

Whereas, the Woman's Club of the City of Bradenton have generously provided the use of their hall which contributed largely to the success of the meeting of the State Horticultural Society, and

Whereas, the City of Bradenton and the citizens of the city have shown every possible courtesy to the members of the Society, and Harvey Caldwell and the Dixie Grand Hotel have contributed splendidly to the pleasure of the members, and

Whereas, Mr. Leo H. Wilson and Miss Margaret Cobb have worked so faithfully for the success of our meeting and have

added so much to our pleasure by staging the rose show and home canned exhibit.

Whereas, the Reasoner Nurseries have contributed very materially to the courtesies extended the members who are visiting in the city, and

Whereas, the Press of the city have been generous in their space in giving notices of meetings and reports of the Convention,

Therefore, Be It Resolved by the Florida State Horticultural Society in regular session at Bradenton this 14th day of April, 1927, that we hereby extend our sincere thanks to the various individuals, firms, clubs and to the city and its citizens for the many courtesies extended which have helped to make the Convention a success and our stay in your midst a sincere pleasure.

The foregoing resolution was moved, seconded and unanimously carried.

C. W. LYONS,
S. O. CHASE,
Committee.

W. J. KROME

A motion was made, seconded and carried that the secretary be authorized to wire W. J. Krome who is ill at his home in Homestead and express our regrets and best wishes for an early recovery; that the secretary also be instructed to have some flowers sent him in token of our remembrance of him.

Deceased Members

Roy E. Lenfest

Charles M. Mallett

Charles Deering

William Allan

A. H. Wartmann

Report of Necrology Committee

Your Committee on Necrology this year has before it the very sad task of having to record the passing away from among us some members whose activities in connection with this Society, whose services are going to be very long remembered by those who have been in close touch with the industries represented in this Society today.

It is hardly necessary for anyone here to attempt to say any kind words about Roy E. Lenfest, whose services to the citrus industry of this state have meant so much during the period of the last few years. Mr. Lenfest is one who is no longer with us.

Charles M. Mallett, of Frost Proof, another man who gave many years of his life to the betterment of the industry.

Charles Deering, of Miami, another member of the Society, who on short acquaintance began to evince lively interest in our horticultural activities.

William Allan, of New York, a life member for many years and at one time a very active member of our organization and who will be remembered very pleasantly by many of our older members.

And your Committee on Necrology also has to record, though the actual date of the passing away was prior to this year, the passing of A. H. Wartman of Citra, another whose name is tied up with this citrus business for a long period of years.

FRANK K. ANDERSON,
Chairman.

Proceedings of the
Florida Rose Society

Second Annual Meeting

Bradenton, April 14, 1927

Pres. Mrs. E. L. Lord: The Second Annual Meeting of the Florida Rose Society will please come to order. In the absence of our secretary will ask Mr. N. A. Reasoner to act as secretary pro tem.

The minutes of the First Annual Meeting of the Florida Rose Society as published in the 1927 Proceedings of the Florida State Horticultural Society were read by Mr. Reasoner and approved without correction.

Mrs. Lord: We will now have the report of our treasurer.

REPORT OF TREASURER

Florida Rose Society

April 13, 1927

Your Treasurer begs to report cash on hand of $15.50, representing 50 cents refund from the American Rose Society on thirty-one members last season. These funds are on deposit with the Manatee River Bank & Trust Company of Bradenton, Florida, as shown in the pass book submitted herewith. No bills having been presented, this fund remains intact.

For the future, I would suggest that we make an urgent effort to increase our membership as rapidly as possible in order to obtain the minimum of fifty members, which as I understand it, would entitle us to a $1.00 per member refund from the parent Society in place of 50 cents as at present.

N. A. Reasoner.
Treasurer.

President's Annual Address

It is usually the custom when opening a session of this kind for the president to make a speech. When a woman (perhaps this is true of a few men), is called upon to perform this duty, the result is actually four speeches, the one she prepares, the one she makes, the one the audience hears, and the one she wishes to heaven she might have given. My apology for attempting to speak at all is the hope that your tolerance may transform the speech that you actually hear into the one I wish I might make.

Ever since I became particularly interested in roses I have been hearing the query "Why doesn't Florida grow more fine roses?" Moved by my conversations with rose growers during the past few years I am minded to give you my personal explanation of the situation and possible remedies.

After the big freeze, to which most of Florida's horticultural shortcomings are customarily attributed, many of those horticulturally inclined were driven out. Those who remained were too busy making a living to bring in and try out new varieties. Roses already in the gardens were treasured and tended, but few new ones could be purchased. The old fashioned Teas, Bengals and Noisettes which could be grown from cuttings and needed little attention were practically everywhere. They still survive in the older quarters of our cities and in negro dooryards. Louis Philippe, Duchess de Brabant, Safrano, Reve D'Or, Perle de Jardins, Anna de Diesbach, Souvenir de Malmaison, Estelle Pradel, Marechal Niel, Chromatella, Lamarque and many others not easily classifiable may be found, if one does not mind rough roads and narrow streets.

While as to rose varieties we may have the reputation of living in a past generation, many of these older favorites cannot be surpassed by the newcomers in their class, and should be preserved.

As money grew more plentiful, flower lovers began to try out new roses; many of these failed because of poor adaptation to our soils, insufficient knowledge of their requirements, or for a hundred other reasons; and the tradition developed that we could not produce good roses. A few skeptics, however, kept on experimenting, until it was found that some roses, which were worthless for their flowers, were especially well suited to our conditions. The success of these as rootstocks, opens up a great opportunity for retesting these discarded varieties.

Our soil and climate set us off so sharply from the rest of the United States, that we have been badly neglected by the rose breeders. The attention of such men has been centered in combining new color combinations with hardiness and adapta-

bility to clay soils, a handicap from our point of view. Many beautiful varieties are discarded because they are too tender, which would have perhaps been very much worth while in our latitude. Only recently has a rose breeder ignored hardiness in seeking new varieties. Captain Thomas of Bloomfield fame has transferred his interests to California, and is seeking to develop everblooming roses for that section. We are hoping that some of his creations may prove suitable for Florida.

However, we differ from California in so many respects that the results would be better, quicker, and surer if we experimented for ourselves. In other words, there is a big field for rose breeding here, and some way should be found to interest breeders in our problems. There are no limits to the possibilities in this field. The breeder who combines the vigor and health of Rosa gigantea or Rosa laevigata with the form, substance, color and ever-blooming habit of the hybrid teas will free us from our bondage to rootstocks, and open up a new rose world to Florida.

It is difficult for the amateur to delve very deeply in rose breeding, but in the testing out of existing varieties he will find great opportunities. Roses respond so diversely to changed environment, that the success or failure of an untried variety can never be prophesied. Such individual tests are rather expensive, as a large number of new roses turn out worthless, or no improvement over their predecessors. A more practical method would be the establishment of trial gardens in various parts of the state. Such gardens have been found of immense value in other states, and are very much needed because of our divergent climate and soil. Besides the points of color, form, substance, fragrance and good foliage and stem, our ideal rose must be adapted to almost daily rains in summer, long dry periods, an almost continuous growing season, with warm stretches during the short winter which stimulate unseasonable growth and possess either ability to grow on light soils or compatibility with our most successful rootstocks.

Mrs. Lord: Mr. S. C. Hjort of Thomasville, Georgia, a prominent rosarian, a commercial grower of roses and a member of the Committee of Consulting Rosarians of the American Rose Society, was to address us today but has been unavoidably detained and cannot be with us. But we are fortunate in having with us another prominent rosarian and commercial grower, Mr. Geo H. Peterson of Fair Lawn, N. J. I think we may claim Mr. Peterson to be one of us because he has a winter home in St. Petersburg where he grows roses for his own enjoyment as well as to study their reactions under Florida conditions.

The Growing of Roses

Geo. H. Peterson

(Stenographic notes of address)

The growing of roses in Florida is quite a different problem to rose growing in New Jersey—Florida has a climate and a soil not well adapted to rose growing, generally speaking.

The selection of a site for the rose bed is a very important thing. Keep away from shrubs and trees as they are likely to provide too much shade and the roots of these plants are liable to invade the rose bed. However, roses in Florida do not want an all day sun, and can use some shade. If this shade is not provided naturally, build a frame work of wood and cover with cheese cloth, the covering to be so arranged that it can be rolled over the bed when needed, which is usually in the afternoon.

Roses ordinarily will not make their best growth in the natural soil. This soil must be improved. A suggestion is to mix muck and cow manure with the soil in the following proportions, two parts of top soil from the ground where you expect to plant the roses, two parts of black muck and one part of finely broken up cow manure. Mix thoroughly together and put into bed about 15 inches deep. Have your beds prepared so as to plant in January.

A practice of very great importance is that of watering. Use a hose of adequate size (at least three quarter inch hose) and to get the best results, the surface of the bed should be sunken a little. We often edge our bed with 7-8 inch cypress, four to six inches wide, and we cover the beds with the grass cuttings from the lawn. This in decaying forms a porous mulch that absorbs and holds the water so that it is not necessary to spray the plants thoroughly more than two or three times a week.

Of the varieties to plant, the Hybrid Perpetuals, as a class, are not well adapted to Florida, however, the Frau Karl Druschki does from fairly well to well in Florida. The Paul Neyron is one of the largest and fullest roses in Florida and grows well. The J. B. Clark is not generally successful in this state.

Among the Teas, Florida has a variety of them that are generally successful and they are grown very common throughout the state. I believe that we should keep more to these than to the Hybrid Teas, as we will probably find more successful varieties among them than among the latter. Among the Teas that deserve especial mention are, the Maman Cochet, White Maman Chocet, Wm. R. Smith,

Marie Van Houtte and the Duchesse de Brabant, as they are perhaps most adaptable to this soil and climate.

Unfortunately for Florida, the Hybrid Teas are superseding everything else. There are more Hybrid Teas grown in Florida, by a big majority, than all other varieties. Of this class the Radiance and the Red Radiance are the most successful. Next, in my experience among the red varieties is the Etoile de Hollande. It has a real rich crimson red bloom and grows very satisfactory. As next choice among the red roses, I would mention Laurent Carle. This variety has proven, on trial, to be very good. The Columbia has also proven successful.

Among the pink roses, Mrs. Henry Morse rates very high in the North and does fairly well here. The Eldorado has done best for me of the yellow roses, but the shade of yellow is very disappointing.

Of the Pernetian roses that are reasonably successful in Florida, Mme Edouard Herriot is the most admired. The color of the flower is a rich salmon, and is not large, but the plant is a prolific bloomer and is the earliest blooming of any rose that we grow in Florida. The foliage is rather delicate and is subject to blackspot as are all varieties of the Pernetiana class.

One of the worst diseases of roses is the black-spot, but fortunately this disease can now be controlled absolutely. This disease usually starts on the green leaves near the base of the plant. It creeps upward dropping the leaves and if unchecked will defoliate the plant. In that condition the plant cannot make any growth or bloom. The disease rarely kills a plant but keeps it weak and dormant.

The remedy which I have used with success is Pomo Dust, a preparation of sulphur and arsenate of lead. Start the use of this preparation in May and continue at intervals until about the middle of August, after which time no dust should be applied. Do not wait until the disease appears before applying the remedy. If you do, the only sure cure is to remove the affected foliage and the good leaves with them and burn them. This dust will also keep away all chewing insects.

In closing I would like to make a few remarks in reference to the American Rose Society and about the value of being a member of this organization. The American Rose Annual, a book of several hundred pages is published each year in March and a copy is sent to each member of the American Society. This book contains much vital and useful information to anyone interested in rose culture either in Florida or any other part of the country. The American Society also publishes a members Handbook which is a very helpful book of small proportions. It contains a variety of information in reference to rose work as well as a complete list of the members in all parts of the world. Members of the National organization are entitled to attend the various rose pilgrimages and are admitted to all rose exhibitions of the Society, so that the $3.00 a year membership is money well spent.

The Florida Rose Society is affiliated with the American Rose Society. When

you become a member of the Florida organization you automatically become a member of the American Rose Society and entitled to the full privileges of membership and to receive all of its publications, as well as those of the Florida Society.

I sincerely hope every rose grower in Florida will become an active member and take an active interest in the Florida Rose Society as this Society has the opportunity, if properly supported, to make Florida a land of roses as well as a land of flowers.

NOTES ON DISCUSSION FOLLOWING MR. PETERSON'S ADDRESS

It is not best to try to carry varieties of the Pernetiana class over a summer in Florida. If you wish Pernetiana blooms for show and for cutting, they must be planted each year. Teas and Hybrid Teas will last through the summer.

Rose plants must be dusted with the Pomo Dust whether affected or not with black-spot, every week or ten days from May to August.

Brown Canker of the rose is very difficult to control. See page 161 of the 1927 American Rose Annual for a detailed discussion of this disease and its control.

Roses should have a rest period, preferably in the autumn of the year in Florida. They should not be forced all the year round.

Pruning should be done after the main blooming season is over, probably November. Pruning done at other times of the year should not be so severe.

Roses should be planted in Florida just as soon as one can get a good dormant bush. This will ordinarily not be before December 15th.

The distance for planting should be 16 or 18 inches each way so as to provide a solid bed effect. The bushes should be close enough so that the foliage when developed will shade the ground.

Rose stocks used in Florida are Texas Wax, Cherokee, Ordorata, Japanese, Multiflora and Ragged Robin, of these the Odorata is very commonly used.

Some of the newer varieties tried in Florida with varied success are: Rev. F. Page Roberts (splendid success), Lord Calvin (did not do well), Luxembourg (very satisfactory) Gruss an Aachen, George Arends. The American Rose Annual for 1927 lists the new varieties of the world on page 214. Try one or two of the new varieties in your garden.

Mrs. Selby of Sarasota described how she obtained sufficient shade for her rose garden. She had a carpenter build an arbor at the west half of her garden. It is so arranged that the roses get all of the morning sun and are shaded in the afternoon. There was also an arrangement whereby a canvas could be let down over the bed entirely shading it if necessary.

Mrs. E. L. Lord: Another speaker whom we had hoped to have with us, was Dr. J. Horace McFarland, the noted editor of the American Rose Annual, who has probably done more than any other one man to popularize the rose in America. Dr. McFarland is very much interested in us in Florida, only a few weeks ago he made a trip through our state studying and observing our roses. Unfortunately his itinerary was so arranged he could not delay it so as to attend our meeting, but he has sent us a message of good cheer which reads as follows:

Paper of J. Horace McFarland

To the Members of the Florida Rose Society:

It is a real grief to me that I cannot come South promptly to meet with the Florida rose lovers who are gathering, and then to enjoy the balmy breezes of April until I can also see the roses at Thomasville a little later. It is unfortunate that even a rose lover has to earn a living, and therefore cannot go and come entirely according to his rose inclinations.

I view the gathering of those who are interested in the rose in Florida as an important and auspicious event. My recent hurried trip through the state gave me the feeling that Florida ought to be a land of roses, and could be, now that she has the people who are willing to think of the rose in Florida terms rather than in the terms of the cold North.

All that I have learned from those who find it possible to have good roses in Florida, all that I have seen and all that I have read join in supporting the attitude that when our rose-loving friends in Florida begin to grow roses in Florida, for Florida, of Florida, the land will surely bloom as it can with nothing else, for no other blooms can take the place of the rose. I shall hope on another visit to find the Cherokee roses taking their unique place, which will easily make our attempts to grow the Altaica form of Rosa spinosissima as the Northern Cherokee look just like the imitations they are.

The Banksia roses, which can give a glory we dare not expect to reach, could again come alive in Florida. All the Noisettes, which make southern California a land of roses, surely can be to advantage at least tried out in Florida, and then one will know whether Reve D' Or and a half dozen other notable items are not just right for Florida.

But the major part of my hopefulness for a continuous supply of roses in Florida is stirring up the Tea rose situation, so that the stronger-growing Teas are given a chance to show what they can do. There are scores of these, not yet important because they are not in the country, but obtainable at very reasonable prices. Then the Tea rose can be improved for Florida, and I am glad to say that Captain George C. Thomas, Jr., perhaps the most acute amateur rose hybridizer in the United States, if not in the world, has already begun, in his California home, to experiment with Teas, having in mind what could be done for Florida.

With a little diffidence I make a suggestion which might help toward carrying over some of the stronger Hybrid Teas in addition to Radiance, as well as the stronger-growing Tea roses through the hot and wet summer of some sections of

Florida. I saw in New Orleans excellent results in growing roses in slightly raised beds, so that they did not have to endure wet feet. Why not, then, provide in Florida a similar advantage? It may be ineffective and it may be quite the contrary.

After all, the best I can say for the rose friends who will gather is that rose growing is the loveliest adventure possible to undertake. Fortunately it is not a sure thing, and even though there be failure, there is always the advantage of the effort and the anticipation. I am sure that if Florida friends will take half the trouble which is found necessary to get rose success in the cold northwest corner of the United States, they will be able to issue to the less favored North, in years to come, a very rosy invitation to see the Queen of Flowers on her throne in the Land of Flowers.

Report of Business Session

In the form of business coming before the Society, the question arose as to whether the Society should continue its affiliation with the Florida State Horticultural Society. It was pointed out by several that the organization was yet young and small in numbers, and without a limited amount of money to carry on its activities. By retaining this affiliation the Horticultural Society would include the proceedings of the Rose Society in its printed proceedings. It would probably require considerably more than $2.00, which each member of the Rose Society pays to the Horticultural Society, to print a separate publication. Until our membership is increased, it would appear unwise to discontinue the affiliation. A motion was then offered and seconded that the Florida Rose Society continue its affiliation with the Florida State Horticultural Society, during another year, and the annual dues in the Florida Rose Society remain at $5.00, this fee to cover membership in the three organizations—The Florida State Horticultural Society, the American Rose Society and the Florida Rose Society. Carried.

The next question was in reference to some definite work for the Society for the next year. The feasibility of a State Trial Garden for roses, as suggested by the president, Mrs. Lord, was considered. The plan in brief, as outlined, was this. That the Executive Committee be authorized to select one or more sites in the state for a Trial Garden, or Testing Grounds for roses. Such a site or sites would have to be donated by the city for the purpose and the city would be expected to be responsible for the up-keep, maintenance and maintaining of the site; the Society to be responsible for the rose bushes—that is furnish the plants, give council and publish the results. After a discussion of this matter, it was moved and seconded that the Executive Committee be given power to go ahead with the plans of establishing official Testing Grounds for Florida. Carried.

It was next moved and seconded that the Executive Committee have authority to sponsor the holding of the Third Annual Rose Show. Carried.

It was decided that the vote for the new officers should be by nomination from the floor.

The result of the election of officers was as follows, the vote being cast for each officer by the secretary pro tem, with

the exception of the vote for treasurer, which vote was cast by the new secretary, Mr. Claude Hebb:

President, Mrs. E. L. Lord, Gainesville; first vice-president, Mrs. S. F. Pool, Winter Haven; secretary, Mr. Claude Hebb, Manatee; treasurer, Mr. N. A. Reasoner, Oneco.

Meeting adjourned.